UNCTAD/DITC/TNCD/2003/3

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
Geneva

ENERGY AND ENVIRONMENTAL SERVICES: Negotiating Objectives and Development Priorities

Chapter II

Environmental Services

UNITED NATIONS
New York and Geneva, 2003

INTERNATIONAL TRADE IN ENVIRONMENTAL SERVICES AND THE DEVELOPING COUNTRIES

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Introduction

The environmental problems that developing countries face are enormous and put in jeopardy the ecological equilibrium not only of those countries but also of the entire ecosystem.

Worldwide, some 2.4 billion people lack access to basic sanitation and 1.2 billion, or one in five, lack safe drinking water. The rapidly increasing urban population in developing countries has generated a mounting demand for drinking water that has outstripped its supply. In most cities in the South piped drinking water is not available to everyone: those without access to safe water supply must buy water from vendors, paying between 4 and 100 times more than the price of water from a piped water city supply. Access to safe water is particularly problematic in Africa: more than 300 million people lack reasonable access to it. In developing countries more than 90 per cent of sewage is discharged directly into rivers, lakes and coastal waters without any treatment. The large majority of African and Asian cities with one or less than one million inhabitants have no sewerage system at all. When a sewage disposal system exists it only serves the rich

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residential areas. Solid waste management, or the absence of it, is an increasingly dramatic problem in developing countries, where about half of the urban population lacks adequate waste disposal and where less than 10 per cent of urban wastes are treated, with only a small fraction of that treatment meeting acceptable standards. Furthermore, in most developing countries squatters' settlements are usually not served by garbage collection services: it is estimated that between 20 and 50 per cent of the solid waste generated in the cities of the South remains uncollected. Air pollution causes premature deaths and chronic illnesses, which have a strong negative impact on the human and economic resources of the countries affected. Air pollution has been a steadily growing problem in developing countries, where urban expansion and rapid industrialization are accompanied by increasing road traffic and growing energy consumption.[1]

As a result of the increase in transnational trade, travel and migration, environmental problems that originate in a country do not remain confined within its boundaries. These problems, then, need to be solved as a matter of urgency and as a precondition for ensuring sustainable development worldwide.

Awareness of the importance of environmental problems has led a growing number of countries, particularly in the industrialized world, to introduce environmental legislation and taxation, and, more generally, has brought about the incorporation of the environmental dimension into overall economic and financial policy. Such action has had a noticeable impact on the expansion of the market for environmental and environment-friendly goods and services. The environmental industry experienced dramatic growth in industrialized countries during the 1980s and most of the 1990s, reaching US$ 522 billion in revenues in 2000; however, it now seems to face stagnation in demand. Firms in countries that are members of the Organization

[1] See Paolo Bifani, *Environmental Needs in Developing Countries and the Environmental Industry*, mimeo, 2002.

for Economic Co-operation and Development (OECD) may therefore be looking to emerging countries for new business opportunities.

Trade in environmental services appears to be relatively free of restrictions in comparison with other service sectors. The concern of exporters of such services would seem to be with the need to achieve greater market access in terms of commercial presence. Unlike in many other services sectors, exports of environmental services involve considerable investment in the importing country and thus ownership and control become a significant consideration. The movement of natural persons is also a relevant factor. Thus, additional commitments on environmental services in the framework of the General Agreement on Trade in Services (GATS) could offer new market opportunities to firms from developed countries and provide developing countries with greater access to such services, to the benefit of the environment, the people and their own developing environmental services industry.

Seven negotiating proposals on environmental services have been put forward in the framework of the ongoing GATS negotiations. All of them address the issue of how to better classify the sector, in view of the fact that an appropriate classification is a precondition for scheduling meaningful commitments. The current GATS classification of environmental services fails to account for the present regulatory reality and for how business operates in this sector. This because it was drawn up at a time when the focus was on end-of-pipe pollution control rather than on prevention, and when environmental services were regarded basically as public infrastructure services provided to the general community. Moreover, little international trade was taking place in the sector at that time: Governments were providing most environmental services and private operators were not allowed or not willing to enter the market.

As in other services sectors, such as the energy sector, trade in environmental services may be affected by lack of market access in other sectors. Engineering, legal, consulting and analytical services are almost invariably in the vanguard of the provision of

environmental services. A new possible classification of the sector would therefore have to address the issue of the so-called non-core environmental services or services with "dual use". Liberalization would therefore include several sectors, where both developing and developed countries could find a trade interest. However, the benefits of such liberalization, in terms of both the trade interests of the exporter and the objectives of the importing country related to environmental protection and building domestic capacity, may not be realized if certain preconditions are not satisfied. In particular, appropriate domestic environmental legislation has to be developed and enforced and economic incentives have to be created to generate a sustainable demand for environmental goods and services.

The lesson that can be learned from the experience of developed countries is that a mixture of command-and-control and economic instruments is perhaps the appropriate way to deal with environmental problems and to ensure, at the same time, that compliance with regulations is not decoupled from economic benefits. Incentives to reduce pollution and to introduce technical innovation (the so-called dynamic efficiency) may be worth introducing, as well as flexibility in the ways and means of complying with environmental requirements. However, the effects of environmental policy instruments on prices, employment, trade and competitiveness should be carefully assessed. Their political acceptability depends on many factors, such as cost, simplicity, transparency and public participation.

A situation conducive to the transfer of environmentally sound technologies (ESTs) needs to be established, and domestic firms need to develop the skill to absorb ESTs and adapt them to local needs. Forging partnerships between firms in developing and developed countries is proving to be a viable tool for helping firms from developing countries to acquire state-of-the-art technologies, reach markets that otherwise would be difficult to access, and become part of an international network. For firms from developed countries, such partnerships facilitate their activities in emerging markets, where environmental and business conditions can be quite different from

those at home. Partnerships seem to have dramatically contributed to enhancing technological capabilities in developing countries.

A gap exists in developing countries between their environmental needs and the resources available to satisfy them. International cooperation and financing are key factors in enabling developing countries to address their most pressing environmental problems. Education and information can encourage public authorities, producers and consumers to adopt more sustainable approaches. Political willingness and leadership play a crucial role in making it possible to devote efforts and resources to environmental improvements. Governments, especially in developing countries where resources are limited and several key environmental needs have still to be satisfied, have an interest in ensuring that environmental policy decisions are the result of a participatory process.

Strengthening capacities in the environmental services sector in developing countries, while primarily aimed at addressing and eventually solving environmental problems, may also result in enabling those countries to become international providers in this field. It can also help them to increase their capacities to meet environmental requirements in the importing markets, become more attractive destinations for foreign direct investments, have easier access to capital and strengthen other domestic sectors such as tourism.

Some developing countries have proved able to build up a solid environmental services sector that has helped them in dealing with environmental problems. As a by-product, they have also been able to export their services. In these successful cases, several elements have played a role, namely political willingness and leadership, appropriate environmental legislation and enforcement, financial resources made available by international agencies, technical assistance provided by developed countries, cooperation between the Government and the private sector, and a participative decision-making process.

The environmental services sector presents equity problems similar to those faced in the health and energy services sectors. In the environmental sector, as in those other services sectors, all considerations ultimately point to the need for Governments to provide a strong and effective regulatory and incentive framework for the private actors involved in providing the services. An appropriate framework reinforces both equity and efficiency. Developing countries may therefore wish to set conditions under which foreign private companies are to operate, possibly in the form of qualifications to market-access commitments under the GATS. These qualifications could focus on measures to ensure equity (e.g. maximum prices for consumers, a percentage of profits that should be reinvested in the infrastructure) or capacity building (e.g. technology and managerial know-how transfer, training of personnel), in conformity with Articles IV and XIX of the GATS.

1. The Market

A. The environmental industry

Environmental services are one segment of the environmental industry. The environmental industry is a fairly new sector, and it presents problems of definition and quantification. According to the OECD, which has taken the lead at the intergovernmental level in defining and classifying the industry, "the environmental industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. These include cleaner technologies, products and services which reduce environmental risk and minimise pollution and resource use, although there is currently no agreed methodology which allows their contribution to be measured in a satisfactory way".[2] The industry is

[2] OECD/Eurostat, The Environmental Goods and Services Industry: Manual for Data Collection and Analysis, Paris, 1999.

going through important changes from a structural point of view (e.g. privatization, consolidation), and as regards the kind of outputs it provides (e.g. from end-of-pipe to cleaner technology) and the goals it aims at (e.g. from compliance with environmental regulations to resource productivity).

More specifically, the environmental industry includes (a) equipment (such as equipment for water supply and delivery; treatment of waste water; waste-handling; air pollution control; laboratory testing and prevention technology); (b) services (such as engineering design; construction and management of utilities; collection and treatment of waste waters; waste collection and processing; hazardous waste management; legal and consulting services; remediation services and strategic environmental management); and (c) resources (such as the sale of water, recovered materials and renewable energy). In 2000, the equipment segment accounted for 23.4 per cent of the whole industry and the resources segment 26.1 per cent, while the remaining 50.5 per cent was accounted for by the services segment.

The environmental industry can hardly be considered a cohesive unit. Within that industry, variation between segments is considerable and variation between developed and developing countries and transitional economies is also great. Among industry segments, recent growth has been led more by the equipment segment than by services or resources. The services markets are in relative decline in the developed countries, mainly because of the fundamental transitions in the industry. In general, customers have been less reliant on services providers to address and solve their environmental problems, while they have been trying to avoid those problems at the outset by changing processes, materials or product line. A separate factor that has led to an increase in sales of equipment as compared with services is the export of equipment. For instance, while the equipment segment in the United States makes up only 26 per cent of the industry, it accounts for 58 per cent of exports. Conversely, while the services segment accounts for more than 50 per cent of industry revenues, it represents only 19 per cent of exports. The globalization of the

equipment market has been facilitated by the inherent nature of the product: it is easier to export a piece of hardware than a consulting project.[3]

According to an estimate from the private sector, in 1996 the global environmental market represented some US$ 452 billion in revenues generated by private companies and public-sector bodies. It reached US$ 522 billion in 2000.[4] Half of the market was represented by fees generated by services, while the remaining half was almost equally divided between equipment sales and the sale of environmental resources such as water, energy or reclaimed material. Eighty-five per cent of total revenue was generated in the United States of America, Western Europe and Japan, with shares of 38 per cent, 30 per cent and 17 per cent, respectively; Asia (excluding Japan) generated 5 per cent of revenue, Latin America 2.4 per cent, countries in the Middle East 1 per cent and Africa 1 per cent. The leaders in the regional markets are Germany, France and the United Kingdom in Europe, the Republic of Korea, Taiwan Province of China and China in Asia (excluding Japan), and Brazil, Mexico and Argentina in Latin America. The collective annual growth in the United States, Western Europe and Japan has represented only 2-3 per cent in recent years, with the remaining growth mainly taking place in developing countries.[5]

The main purchasers of environmental goods and services have traditionally been (a) local authorities, which buy products such as equipment or laboratory services to discharge their tasks; (b) federal Governments, which hire environmental service providers for institution-building and to help them carry out their environmental initiatives; and (c) several manufacturing sectors, which buy goods and services from other firms to comply with environmental requirements or to improve their environmental performance. The

[3] See Grant Ferrier in this volume.
[4] These estimates include sales of equipment, services and natural resources.
[5] See Grant Ferrier in this volume.

public sector devotes the largest share of its environmental expenditures to water and effluent treatment, waste-handling and recycling, and cleaning up contaminated sites, while the private sector invests mainly in air-pollution control and waste treatment. In the OECD countries, total environmental expenditure is evenly divided between the public and private sectors, while in developing countries the public sector accounts for around 70 per cent of overall environmental expenditure. The public sector is also a large provider of environmental goods and services, providing the infrastructure for drinking water, waste-water treatment, waste management and decontamination, resource management and silviculture. However, things are changing: because of privatization in both developed and developing countries in the water, energy and waste sectors, private companies are replacing public authorities in the delivery of environmental services. On the other hand, some public-sector bodies that have developed expertise in the environmental services area are making it available to other countries, and are therefore competing with private firms in the market.

Traditionally, the environmental industry has not been very export-oriented. This is because for a long time local demand has provided enough business; small and medium-sized companies – which account for half of the market – have little inclination and limited capacity to export; and specific expertise linked to local environmental problems and conditions is often required. In 1998, in the United States only 10 per cent of industry revenues were generated from overseas business. In the same year, Germany exported around 20-25 per cent of its environmental industry capacity and Japan 15-20 per cent.[6] However, the trend towards harmonizing national environmental standards, adopting global environmental targets (especially through the implementation of multilateral environmental agreements) and privatizing utilities is making the industry more trade-oriented.

[6] Ibid.

The environmental industry has a dual structure, with a small number of large firms accounting for about 50 per cent of output in individual market segments and a large number of smaller firms accounting for the remainder. In 1995, the top 50 companies in the industry represented 18.6 per cent of the market, with American and French firms taking the lead. In 1998 the top 50 companies accounted for 20.6 per cent of the market, with a French firm as leader. No companies from developing countries appear in the list of the top firms.[7]

In most industrialized countries, and especially in the United States, the environmental industry is now showing the characteristics of a maturing industry: decelerating growth, intense competition, increasing consumer sophistication, pricing pressure, consolidation of market share by larger players, reduced profitability and strong merger-and-acquisition activity. In these countries the period of rapid growth – which was mostly related to the implementation and enforcement of environmental legislation – seems to be over. The high degree of compliance with existing legislation by the major industrial sectors, fewer new regulations and less stringent enforcement may have made the demand for environmental goods and services stagnate.[8] Some firms from developed countries providing environmental goods and services are therefore looking for new market opportunities.

The most rapid market growth may occur in developing countries, where booming population, fast-paced urbanization and flourishing industrialization create an enormous need for environmental goods and services: developing countries are in a "catch-up" mode and are addressing the most pressing pollution problems, much as the

[7] Ibid.

[8] D.R. Berg and G. Ferrier, "The US environmental industry", in *Meeting the Challenge: US Industry Faces the 21st Century*, United States Department of Commerce, Technology Administration, Office of Technology Policy, September 1997.

developed world did in past decades. However, scarce financial resources and competing needs, the absence of environmental regulations and enforcement instruments, and limited awareness of the risks associated with environmental problems, limit the potential demand in those countries.

Text box no. 1
Environmentally sound technologies

There are no commonly accepted definitions of environmentally sound technologies (ESTs), although they do share some generally recognized features – such as the fact that they are introduced in a highly regulated framework, represent a response to urgent global environmental problems and may benefit from public funding for research and development – and it is increasingly recognized that these features distinguish them from other technologies. It should be noted, however, that because of the evolving nature of environmental problems, what might be perceived as environmentally sound today may not necessarily be seen in the same way tomorrow. Moreover, a technology perceived as environmentally sound in one country may not be seen in the same way in another. The definition of environmentally sound technology, the environmental industry and environmental companies will continue to change. However, for the purposes of clarity, ESTs may be considered to refer to "clean" technologies which have little impact on the environment in terms of pollution or which are high in energy efficiency compared with other technologies currently in use. They are often categorized as "end-of-pipe" and "cleaner" technologies. "End-of-pipe" technologies concentrate on removing pollutants from waste streams; they include filters, waste incinerators, dumpers, composters, and dust and grease interceptors. Cleaner technologies are those which optimize the existing process of production by ensuring the correct measure of inputs and the reduction of pollution during and after the economic activity, as well as those which require more drastic changes in the production process and product composition, and thus avoid pollution from the beginning of the production process. Some examples of cleaner technologies are procedures that clean raw materials before they are used, processes that reduce the creation of hazardous wastes during production, and the use of substitutes for chlorofluorocarbons (CFCs).

The OECD/Eurostat Manual Classification includes in the "Cleaner/resource-efficient technologies and processes" those technologies which decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimise waste disposal problems, or some combination of these.

Source: UNCTAD in cooperation with the United Nations Environment Programme (UNEP) and the Department of Economic and Social Affairs (DESA), "The role of publicly funded research and publicly owned technologies in the transfer and diffusion of environmentally sound technologies", background document for the International Expert Meeting on the role of publicly funded research and publicly owned technologies in the transfer and diffusion of environmentally sound technologies, Kyongju, Republic of Korea, 4-6 February 1998; C. Almeida, 'Development and transfer of environmentally sound technologies in manufacturing: a survey', UNCTAD Discussion Papers, No. 58, April 1993; and OECD/Eurostat, Environmental Goods and Services Industry Manual Classification, Paris, 1999.

In **Latin America** expanding population and urbanization mean that there is a need to find solutions to serious air, water and waste problems. Therefore, the market has seen infrastructure-related projects, primarily in sewage treatment and water delivery, as the main drivers. In particular, the market for water and waste-water treatment is expanding rapidly. British and French water companies, thanks to a comparative advantage gained mostly as a result of accelerated privatization, have been able to take advantage of the demand and are providing integrated, system-wide solutions. The control of air pollution, from both stationary and mobile sources, has recently become an item on the regional environmental agenda, but legislation and enforcement are still lacking. The economic downturn experienced by most countries in the region in the recent years has had a significant negative impact on environmental projects in the region, since countries are not willing to enforce burdensome environmental regulations that could penalize their exports. In this context, there is little incentive for the development and implementation of environmental legislation, which is one of the main drivers of the environmental industry. However, the demand for environmental goods and services varies considerably across countries and within countries.

In **South-East Asia**, most countries have implemented legislation related to air, land and water protection and have set up environmental authorities. Region-wide standards and regulations, particularly on hazardous waste and vehicle emissions, are being developed. Malaysia is in the process of privatizing the sewerage system of the entire country, while Indonesia, Thailand and the Philippines have started build-operate-transfer schemes in public utilities and public/private collaborations open to foreign participation. Some leading industries, such as the electronics industry, have already made the switch from end-of-pipe to cleaner technology, but fast-paced development and the concentration of industries in specific areas still create enormous environmental problems. Before the 1997 financial crisis, the South-East Asian market was regarded as the world's fastest-growing environmental market and many analysts believe that environmental markets are at present emerging even stronger than before. Opportunities exist especially in the most essential areas such as drinking water, immediate health concerns and clean-up of properties of high commercial value. In the Republic of Korea, the environmental market is mainly related to air-pollution control and waste management as a result of the implementation of strict legislation on air emissions and of a new waste policy which encourages incineration rather than landfill and aims at increasing recycling.

In **China**, the regulatory structure for environmental protection is probably more extensive and developed than in most other developing countries. However, environmental authorities do not have the resources to enforce regulatory policies throughout the country. Multilateral and bilateral assistance seems to be driving market growth at present, much as in the rest of the developing world, although provincial and municipal governments are emerging as legitimate customers for environmental service providers. The spending programme implemented by the Government on outside lending focuses on building and upgrading disposal and sewerage facilities in major cities, as well as water supply and treatment systems and solid waste management. Forecast growth is strong at 10-14 per

cent, with infrastructure supply and the services segments leading the way.

In **Africa**, rapid population growth and urbanization are making drinking water supply, solid waste disposal and waste-water treatment the main concerns. The African Development Bank has estimated that 73 per cent of the market is represented by water supply and sewerage, 23 per cent by waste management equipment and 13 per cent by pollution control equipment.[9]

B. The Environmental services segment

The environmental services sector is difficult to identify as a coherent sector. The public infrastructure services of drinking water, waste-water treatment and waste management are the core and most traditional environmental services, while services related to compliance with environmental legislation and remediation have developed in a subsequent phase. "Next-generation" environmental services are those aimed at helping companies to reduce pollution as part of the process of pursuing resource efficiency, high productivity and increased competitiveness not solely driven by regulations.[10]

[9] The analysis of the regional markets is based on Environmental Business International, Inc., San Diego, CA, USA, "The global environmental market and United States environmental industry competitiveness", executive summary of a research project and report funded by a grant from the United States Environmental Protection Agency entitled *The Global Environmental Industry: A Market and Need Assessment*, 1995.

[10] In its recently developed classification, the OECD includes services in the three main categories into which the environmental industry has been divided: "pollution management"; "cleaner technology and product"; and "resources management". However, the following detailed list of environmental services is included in the "pollution management" category: air pollution control; waste-water management; solid waste management; remediation and clean-up of soil, surface and ground water; noise and

For the purpose of this study, environmental services are divided into four segments: (a) environmental infrastructure services; (b) air-pollution control services; (c) remediation services; and (d) support services. [11]

(a) Environmental infrastructure services include services mainly related to water and waste management. More specifically, they include: the engineering design of equipment for the delivery and treatment of drinking water; the design of equipment for handling, storing and transporting solid, liquid or hazardous waste; the design, management and operation of waste-water treatment plants; the management and maintenance of drinking-water systems; the collection, treatment and disposal of solid waste; and waste recovery and recycling. In the OECD countries, environmental infrastructure services are mainly provided by municipalities and large firms or transnational corporations with a long-standing presence in the market. Traditional firms are expanding and taking advantage of privatization, mainly through acquisitions. In developed countries, the infrastructure for both water and waste is generally adequate, and so this segment is experiencing only limited growth, mainly related to periodical improvements. However, water utilities in Europe estimate that they will need to invest around US$ 152 billion by 2005 to

vibration abatement; environmental research and development; environmental contracting and engineering; analytical services, data collection, analysis and assessment; education, training and information; other (specific environmental services not elsewhere classified). See OECD/Eurostat, *op. cit.* A private-sector classification divides environmental services into the following categories: analytical services, waste-water treatment works, solid waste management, hazardous waste management, remediation, consulting and engineering. See Environmental Business International, Inc., *op. cit.* In the absence of a global statistical and methodological system for data collection in this specific industry, the latter classification has been widely used.

[11] The description of these segments and related trends is based on interviews with companies operating in the environmental market.

comply with EU regulations on sewage treatment.[12] The city of New York was recently confronted with new federal water standards. Official calculated that they would have to invest some US$ 5 billion to upgrade the city's water infrastructure to comply.[13] On the other hand, this segment may well expand rapidly in developing countries, since it is a high priority for most of them.

(b) Air-pollution control services consist of engineering design, installation and operations management of pollution control and abatement equipment and systems at stationary and mobile pollution sources, usually addressed in industries according to the intensity of their energy use, with power utilities in the forefront, followed by producers of primary metals and heavy industry. United States companies used to be the most competitive providers in this segment of the industry, mainly because the first comprehensive air quality legislation was passed in the United States (Clean Air Act, 1970). However, countries in Western Europe and Japan subsequently introduced air-control-related regulations that are stricter than those in the United States, and are now the international leaders. The need to comply with the requirements of multilateral environmental agreements (the United Nations Framework Convention on Climate Change and the Montreal Protocol on Substances that Deplete the Ozone Layer) aimed at reducing, stabilizing or replacing gas emissions that pollute the air or damage the atmosphere has created demand for air-pollution control technology in both developing and developed countries. Large companies are active in the market, sometimes as subsidiaries of companies operating in other segments of the industry or in the power sector.

[12] "Dirt poor: A survey of development and the environment", *The Economist*, 21 March 1998.

[13] The standards were met instead by spending about US$ 1 billion on preserving forest and agricultural systems in the Catskills, the source of the city's water. See "Pulp friction", *The Economist*, 16 March 2002.

(c) Remediation services include site clean-up activities, emergency response to specific accidents, and remediation assessment and design. Remediation services are usually provided by medium-sized specialized firms or by large firms that also operate in other segments of the market. The demand for land remediation activities has been fairly strong in the United States because of strict legislation and enforcement (especially through the Superfund Amendments and Reauthorization Act of 1986), but it has never been consistent in Europe and is almost non-existent in developing countries. However, the demand for remediation services is declining in the United States because of the relaxation of legislation and less strict enforcement. Demand could rise in the long run in developing countries, especially to increase the economic value of areas that are at present contaminated, or as land scarcity and development needs turn attention to contaminated properties as opposed to the continued exploitation of undeveloped properties.

(d) Support services include analytical services such as environmental laboratory testing or on-site analytical and monitoring services, legal services, consulting services, auditing, research and development, and strategic environmental management. Consulting and engineering services also support local and federal governments with environmental institution-building, monitoring, compliance assurance and enforcement. These services are typically provided by small or medium-sized companies. This segment seems to be experiencing a decline in developed countries. The main goal of support services is to help companies to comply with environmental legislation. However, since most major industrial groups in developed countries comply with the rules and only limited new legislation is being implemented, the need for this kind of service seems to be shrinking. New openings will result from the implementation of voluntary instruments, such as environmental management systems (e.g. ISO 14001) or eco-labelling programmes. However, it is unlikely that they will compensate for the loss of business opportunities related to environmental regulatory compliance, even though some evidence suggests that the use of environmental management systems is spreading in developed and developing countries. Litigation appears

to be declining in industrialized countries, since existing legislation has already been interpreted and implemented. On the other hand, this segment might well grow rapidly in developing countries, where there is an increasing need for feasibility studies on infrastructure development, capacity-building for drawing up environmental legislation and for setting up appropriate environmental authorities, environmental impact assessment (also environmental impact assessment related to the international financing of environmental projects), and environmental due diligence related to multinational acquisitions.

The delivery of services is frequently accompanied by the delivery of goods and technology: goods, services and technology form an integrated package to address a particular environmental problem.

2. Demand-generating factors in the environmental services market

Four main drivers may be identified: (a) regulations and market-based instruments; (b) education, information and public pressure; (c) economic and financial considerations; and (d) tax policy.

A. Regulations and market-based instruments

The implementation and enforcement of environmental legislation has been the traditional driver of the environmental services market. The link between environmental legislation and the demand for environmental services is very close. For example, the Japanese air-pollution control industry expanded rapidly in the 1970s and early 1980s as a result of increased domestic demand following specific legislation in this area. German expertise in water and effluent treatment equipment derives in large part from early and stringent national legislation relating to water-pollution control. In the Netherlands, the effort to overcome land contamination problems has

led to the development of advanced soil-remediation technologies. In the United States, legislation relating to site clean-up and toxic wastes greatly contributed to the country's international leadership in hazardous and waste management technologies.[14] Private management of the water and waste-water infrastructure in France has resulted in French companies assuming world leadership in this segment. When firms develop expertise in a specific field in response to domestic legislation, they have the opportunity to become internationally competitive in that field.

Command-and-control instruments have been relied on in the first phase of countries' efforts to deal with environmental problems and, in general terms, have led to a noticeable improvement in the environment. Environmental expenditures have focused on minimizing the negative consequences of pollution, waste accumulation or contamination rather than on preventing them. As a consequence, compliance with environmental regulations has often been associated with costs and decoupled from benefits.

Rules related to investments in infrastructure are a particularly powerful driver of demand for environmental goods and services. For both foreign and domestic investors it is crucial to know the environmental rules they have to comply with and the liability they have to face. In developing countries, it seems that investments are the main driver of demand for environmental services at present.

Environmental improvements can also be achieved through the introduction of economic instruments. Economic instruments – such as environmental charges and taxes, tradable permits, emission fees and tradable emissions allowances, and environmental subsidies [15] –

[14] OECD, *The OECD Environmental Industry: Situation, Prospects and Government Policies*, Paris, OECD, GD(92)1, 1992.

[15] According to the WTO Agreement on Subsidies and Countervailing Measures, subsidies that provide assistance to firms to promote adaptation of existing facilities to new environmental requirements imposed by law and/or

are generally used in addition to regulatory instruments. They complement regulations by providing incentives for pollution abatement and/or a source of revenue for financing environmental services. The lesson in environmental policy development from several developed nations is that while the regulatory approach seems adequate in the first phase of dealing with environmental problems, economic instruments appear to be more effective in the second phase, when the objective is to raise environmental performance beyond compliance and to stimulate continuous environmental improvement. Experimentation with economic instruments is quite widespread[16] and their use is being reinforced in several countries through the introduction of new instruments and by making the existing ones more effective and capable of inducing real changes in polluters' behaviour.[17] Economic instruments, however, have not yet been institutionalized as major market drivers, and their full effect on companies' behaviour and on environmental quality has yet to be realized.

Developing countries do not constitute a homogeneous group: while most of them are still in the first phase of addressing environmental problems – and therefore the command-and-control approach seems adequate, creating a demand for a broad spectrum of environmental services – others are already introducing market

regulations that result in greater constraints and financial burden on firms are non-actionable if they are granted as a one-time non-recurring measure and are available to all potentially interested firms.

[16] For example, Poland uses air-pollution taxes, China uses waste-water discharge fees, the Netherlands, Denmark and the Republic of Korea use packaging deposit/refund systems, Indonesia and Brazil use watershed charges, Malaysia and Guatemala use carbon offsets, China and Germany use over-compliance credits, and the United States, Germany, the Netherlands, the United Kingdom, Australia, Canada and Thailand use tradable permits. See Berg and Ferrier, *op. cit.*

[17] J.P. Barde, "Economic instruments for environmental protection: experience in OECD countries", in *Applying Market-based Instruments to Environmental Policies in China and OECD Countries*, OECD, 1997.

instruments to complement regulations. This generates an additional and differentiated demand for the products of the environmental industry. The need to comply with environment-related requirements in the importing markets is also stimulating demand for environmental goods and services in the manufacturing industries of developing countries.

The expansion of demand from the public sector is hindered by budgetary constraints: insufficient public funds are available to meet the need for environmental infrastructure building/upgrading and clean-up in developed and developing countries. Another driver of demand in the public sector has traditionally been the implementation of large construction projects, such as roads, bridges or hydroelectric power stations. However, public funds for these purposes seem to be shrinking in both developing and developed countries. Lack of awareness by public authorities, especially in developing countries, of the risks and costs related to environmental problems represent an additional obstacle to the expansion of demand in the public sector.

B. Education, information and public pressure

Environmental education stimulates both producers and consumers to appraise the benefits of a less polluted environment and may facilitate the inclusion of environmental considerations in business practices and consumption patterns. The generation and dissemination of information on the interaction between economic and environmental choices and on their costs can alter the public perception of environmental risks and problems, thus leading to more sustainable approaches. In many developing countries, the very limited availability and poor quality of information on natural endowments, environmental risks and costs accentuate the difficulties in making people accept having to pay for the delivery of environmental services, such as water supply or waste collection. Requiring disclosure or reporting of air and water emissions, waste generation and environmental liabilities serves as an important step in improving environmental behaviour in the industrial community,

through public information and increasing public accountability on the part of the generators of waste and pollution. A requirement that information be made public can be viewed as a market instrument because it enables consumers to choose, and can be effective in altering corporate behaviour. Well-informed public opinion may be supportive of public decisions that would otherwise be unpopular, such as to increase water prices or to shift public funds from other purposes to environmental improvements. There is a trend for enterprises to disclose to the general public information concerning their environmental policies, objectives and programmes and the corresponding costs and benefits, and to disclose and provide for environmental risks. How an enterprise's environmental performance affects its financial health is often a matter of concern to investors, owners and shareholders, because of the impact that environmental costs may have on the financial return on their investment in the enterprise. However, customers, suppliers, regulators and the general public may also have an interest.[18] The call for greater transparency also affects public utilities. According to the 1998 government green paper on utility regulations, information on British utilities held by regulators should be disclosable unless companies can show that this will cause substantial harm.[19]

In response to the setting up of vocal environmental groups, and in order to respond to consumers' expectations in domestic or foreign markets, firms have started including environmental concerns in their business practices with the aim of acquiring a "green" image and the related market advantages (premium prices, increased market share, increased acceptability as a supplier). This trend has led to the well-known phenomena of "eco-labelling" – where products are identified as being more environmentally acceptable than competing

[18] Working Group of Experts on International Standards of Accounting and Reporting (ISAR), "Position paper: Accounting and financial reporting for environmental costs and liabilities", UNCTAD, TD/B/COM.2/ISA/2/Rev.2, 13 February 1998.
[19] "Utility regulation: Going backwards", *The Economist*, 28 March 1998.

products – and environmental management systems, such as ISO 14001, whereby companies adhere to a set of voluntary rules in order to be able to better control the environmental impact of their activities. The willingness to have a green image is a driver for export-oriented firms and transnational corporations in particular. Global companies often feel that they have to address global environmental problems as a sign of their economic and moral leadership. However, public pressure is not always strong and coherent enough to represent a sustainable driver of the demand for environmental goods and services.

C. Economic and financial considerations

The demand for environmental services may be unrelated to the regulatory system, and may derive from economic and financial considerations. Firms that have integrated environmental factors in their decisions, by investing in research and development and by adopting advanced production processes and product designs, usually reap economic benefits due to a more rational use of raw materials and energy and the reduction, avoidance or reutilization of waste. However, in the environmental sector, as in any other sector, companies eventually reach the point of diminishing returns. This means that the additional efforts they make in improving environmental performance represent a cost that does not lead to any saving, unless market rewards for excellent environmental performance are in place. Some leading companies in the OECD countries have already implemented those measures that really pay, and so further steps to become "cleaner" will be increasingly expensive.[20] For other companies, there is still room for environmental

[20] Monsanto, a large American chemical company, admitted that the costs of doubling investment in environmental protection in the late 1980s absorbed most of the improvement in profit margins the company might otherwise have enjoyed in that period. Texaco planned in 1995 to invest US$ 1.5 billion a year for five years in environmental compliance and emission reduction. The total investment will be three times the book value of the company and

improvements that are also economically viable, especially in the area of waste avoidance and reutilization. However, it seems that firms are going to introduce them at their own pace. Evidence from some developing countries, especially in Latin America, shows that firms have implemented those pollution prevention measures that involve little investment, short implementation periods and simple technology, such as water, energy and input savings, and that these practices lead to positive economic returns when first adopted. However, measures that involve more complex technology and greater uncertainty, greater investments and longer lead time, have not been applied. Moreover, the adoption of more advanced environmental practices has been concentrated in a limited number of firms, especially large, export-oriented firms and the subsidiaries of transnational corporations.[21]

Financial considerations can also be a factor in generating demand for environmental goods and services. Insurance premiums, credit conditions and treatment of liability may be differentiated between companies that can show sound environmental performance and the others. In the United States, the Securities and Exchange Commission now requires that all publicly traded companies listed on the stock exchange quantify their contingent liabilities. This mostly relates to environmental liabilities such as contaminated properties, and the requirement has stimulated demand for analysis and clean-up by environmental services firms.

twice its asset base. Yet this project will provide little revenue. Even though these figures may turn out to be exaggerated, they give an indication that pollution prevention is not free. See F. Cairncross, *Green, Inc*., London, Earthscan, 1995.

[21] D. Chudnovsky, A. López and V. Freylejer, *The Diffusion of Pollution Prevention Measures in LDCs: Environmental Management in Argentine Industry*, Centro de Investigaciones para la Transformación (CENIT), January 1998.

D. Tax policy

According to some, the surest path to sustainable development is through ecological tax reform, whereby the environmental damage dimension is incorporated in taxation policy. In this view, the goal of fiscal policy would be to incorporate the social and environmental costs of any activity or product in its purchase or manufacturing price, allowing the market to effectively reward the most sustainable products. In the current system, pollution is an externality in economic terms, and ongoing pollution, waste generation and resource consumption only serve to continuously reduce the economic value of the natural resource base. An effective two-track environmental policy in the form of compliance-focused regulations and economic instruments, together with effective economic policy reform based on ecological tax reform, might ensure that developed and developing countries would pursue sustainable development. However, there is a widespread recognition that the levying of environmental taxes would need to be facilitated by some kind of international cooperation or harmonization, so as to avoid undermining the international competitiveness of those introducing ecotaxes unilaterally.

The above-mentioned drivers, however, can be effective only if certain preconditions are met: there must be, for example, an administrative infrastructure (e.g. a billing company) that allows for the assessment of costs of natural resources and environmental services and the collection of fees; the political willingness and leadership to make it possible to take decisions that may be controversial; and a threshold economic level. Several low-income countries and LDCs are below the economic threshold that would allow them to provide basic environmental services to the population.

Text box no. 2
Privatization in the water sector

Across developed and developing countries, local governments are granting water concessions to private firms. For example, in the Philippines the water supply, treatment and distribution utility serving metropolitan Manila, Rizal and part of Cavite was privatized in August 1997. It awarded 25-year concessions to two consortia (including Philippine, British, American and French industrial groups) to assume full operational and investment responsibility for the cities' water and sewage system, covering 11 million people. In 1992 a consortium led by a French firm won a 30-year contract to run water and sewerage services in Buenos Aires; the same company was subsequently awarded a 25-year contract to construct and operate a drinking-water treatment plant in the city of Medan, Sumatra (Indonesia). China's first water supply build-operate-transfer (BOT) project was approved in July 1998 to help meet the demand for water in Chengdu (3.2 million inhabitants). This is the first urban water infrastructure project approved by the Government using foreign funds (consortium led by a French firm) under a BOT plan. In South Africa a subsidiary of a French company won a EUR 76 million build-own-operate-transfer (BOOT) contract for the construction of a treatment plant for the recycling of process effluent water in Durban.

A services contract valued at US$ 25 million was awarded in September 1999 to a consortium for managing the water supply and distribution system for Maputo and the four other major cities (2.5 million people) in Mozambique. The programme relies upon financing from the World Bank. Some questions remain, however, about the notion of profits being made from public services. On the one hand, the involvement of private companies often produces dramatic improvements in the efficiency of water utilities – which are often bureaucratic, inefficient and corrupt – and provides the capital needed to connect millions of new customers. On the other hand, private entities operate on the basis of market rules, and it is questionable whether those rules are always consistent with the public interest. It can be argued that all the profits generated by water supply, or most of them, should be invested in water infrastructure. Similarly, conflicting views are found regarding water prices. With few exceptions, consumers worldwide are charged less for the water they consume than it costs to provide it. A survey of water projects financed by the World Bank showed that the average price charged for water covered only a third of the cost of supplying it. Usually, this shortfall is

made up by government subsidies, or by allowing the infrastructure to deteriorate. According to some, artificially low water prices cause problems, particularly in developing countries. Consumers are given little incentive to conserve water, utilities are reluctant to connect new customers because prices are too low to allow them to recoup their investment and, ultimately, the subsidies intended to ensure that water is a basic entitlement for everybody end up penalizing the poor. According to others, a rise in water prices would have negative effects on basic cleaning habits, such as hand-washing, and would thus increase the risk of spreading diseases; in this view government subsidies are necessary policy tools. However, Governments that subsidize water prices face high costs that they might not be in a position to afford in the long run, especially if they are trying to improve the infrastructure at the same time. The question remains of how additional resources to satisfy basic environmental needs can be mobilized.

Source: For the case studies see: OECD, Environmental Goods and Services – The benefits of further global trade liberalization, Paris, 2001.

3. GATS commitments in the environmental services sector and the negotiating proposals

A. GATS commitments

According to GATS, and in accordance with the United Nations Central Product Classification (CPC), environmental services include: (a) sewage services; (b) refuse disposal services; (c) sanitation and similar services; and (d) other (cleaning services for exhaust gases, noise abatement services, nature and landscape protection services, and other environmental services not elsewhere classified). Therefore, the classification reflects a very traditional view of environmental services as largely public infrastructure services supplied to the general community, and focuses mainly on waste management and

pollution control.[22] Most non-traditional environmental services are, then, excluded from this classification. More specifically, the GATS classification is narrow for a number of reasons: (a) it is not clearly organized according to the provision of services for specific environmental media (e.g. water, soil, air, noise); (b) it focuses on traditional "end-of-pipe" approaches with no or little coverage of pollution prevention and sustainable resource management services; (c) it covers the services provided in the operation of certain facilities, plant and equipment, but not the design, engineering, R&D and consulting services necessary for building and upgrading them; and (d) it focuses on services supplied to the general community and overlooks those supplied directly to the industry.[23]

The favoured modes of supply for environmental services are commercial presence and the presence of natural persons. However, information technology now makes it possible to use the cross-border mode of supply for the partial or full delivery of some services (mainly support services), although this would not be feasible for the majority of traditional labour-intensive environmental services, such as waste management, sewage treatment and water utilities. There seems to be limited scope for consumption abroad in this sector, with the exception of some education-related services and some services linked to the transport and handling of waste.

Nearly 50 member countries of the World Trade Organization (WTO) have made commitments on environmental services in the context of the GATS, but they include those that are the major players in the international markets (see table 1). The majority of commitments have been made by developed and Eastern European countries (20). Only two commitments are scheduled by countries from the Asian region and two from Latin America. The remaining commitments have been made by countries from Africa. Notably, no

[22] OECD, *Environmental Goods and Services: The benefits of further global trade liberalization*, Paris, 2001.
[23] Ibid.

limitations on foreign investment have been included in the specific commitments, although limitations included in the horizontal commitments, which reflect economy-wide legislation and affect all services sectors, might restrain foreign investment in this sector.

Further commitments under the GATS relating to commercial presence and the presence of natural persons could stimulate trade in environmental services and encourage foreign investment in developing countries. The impact on trade of such commitments, moreover, might be enhanced by liberalization in other service sectors. There is a significant component of specialized services in virtually every environmental project, from design to engineered solutions. Few environmental solutions are standardized and off-the-shelf, hence the widespread and often ongoing involvement of consulting, engineering and management services. Liberalization efforts might therefore be extended to other service sectors that touch on the environmental area, such as construction services, engineering services, research and development, legal services, accounting, auditing and bookkeeping services, and management consulting services.

An additional peculiarity of some environmental services, especially those related to utilities, is that they involve considerable investment, which can only be recouped in the long run. Thus, ownership and control become a significant consideration, and liberalization in this area may be worth considering as far as the environmental sector is concerned.

Table 1. Commitments on environmental services made under the GATS*

Environmental services – 37 country commitments overall
(A) Sewage services – 29 commitments
(B) Refuse disposal services – 30 commitments
(C) Sanitation and similar services – 31 commitments
(D) Other services – 28 commitments

Modes of Supply of Service	Fully open market access				No restrictions on national treatment				Barriers to trade if free trade is not granted
	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	
Cross-border	8 (28%)	8 (27%)	10 (32%)	12 (43%)	10 (35%)	10 (33%)	11 (36%)	11 (39%)	Technical unfeasibility.
Consumption abroad	25 (86%)	26 (87%)	26 (84%)	24 (86%)	26 (90%)	28 (93%)	27 (87%)	25 (89%)	None
Commercial presence	27 (93%)	26 (87%)	31 (100%)	25 (89%)	29 (100%)	30 (100%)	31 (100%)	27 (96%)	Licences, authorization, limited number of licences issued; domicile needed; economic needs test, monopoly; foreign equity limited to 49%.
Movement of suppliers as natural persons	1 (3%)	1 (3%)	2 (7%)	1 (4%)	3 (10%)	6 (20%)	7 (23%)	8 (29%)	Licence; operate through local representative.

* This table indicates the number of countries that have made commitments in each subsector of environmental services on market access (first set of columns) and on national treatment (second set of columns), according to the four modes of supply of the GATS.

B. The negotiating proposals

At the time of writing, seven negotiating proposals on environmental services had been introduced in the framework of the ongoing GATS negotiations: five by developed countries – the United States, the European Communities, Canada, Switzerland and Australia – and two by developing countries, Colombia and Cuba.

The proposals have some common elements. First, all of them are based on the assumption that further trade liberalization of the environmental services sector may lead to a "win-win" situation where environmental protection and economic growth are pursued in parallel. The increased competition that will result from improved market access for foreign firms can lead to innovation and improved services. Less expensive and better-quality services will serve to make health, safety and environmental protection more efficient and improve access to drinking water, sanitation facilities and garbage collection systems for all segments of the population, especially in developing countries. At the same time, further market liberalization will create new business opportunities for environmental services suppliers. New business opportunities will in turn increase investment in the host country, facilitate the transfer of environmentally sound technology, and favour partnerships between foreign and domestic firms.

All the negotiating proposals address the problem of the inappropriateness of the present classification of the sector and include suggestions on how to better classify it. They also offer suggestions on how to treat the so-called ancillary or dual-use services. The proposals of the EC, Colombia and Australia refer also to the mutually exclusive nature of the GATS classification list and call for its preservation. A more appropriate classification of the sector is regarded in all proposals as a precondition for scheduling meaningful commitments.

The **United States'** proposal[24] suggests the establishment of a core list of environmental services, which are those classified as such in the current classification, and a list of environmentally related services, which are those necessary for the provision of environmental services, such as construction, engineering and consulting services. Both core and related services should be liberalized. Such liberalization would be most beneficial in the context of modes 3 and 4. The proposal states that the liberalization of the environmental services sector must not impair the ability of Governments to impose performance and quality controls on environmental services and to ensure that services providers carry out their tasks in an environmentally sound way.

The proposal of the **EC**[25] foresees the creation of seven "purely" environmental sub-sectors (as opposed to the three present ones), namely, water for human use and waste-water management; solid/hazardous waste management; protection of ambient air and climate; remediation and clean-up of soil and water; noise and vibration abatement; protection of biodiversity and landscape; and other environmental and ancillary services. Other specific services – which facilitate the provision of environmental services, but which are also used for other purposes (dual-use services) – should remain classified elsewhere in the classification list. These are: business services with an environmental component; R&D with an environmental component; consulting, contracting and engineering with an environmental component; construction with an environmental component; distribution with an environmental component; transport with an environmental component; and others with an environmental component. The EC propose that these services could be included in a checklist that could be used as an aide-mémoire during the negotiations. The proposal encourages WTO members to

[24] WTO, *Communication from the United States. Environmental Services*, S/CSS/W/25, 18 December 2000.
[25] WTO, *Communication from the European Communities and their Member States. GATS 2000: Environmental Services*, S/CSS/W/38, 22 December 2000.

schedule liberalization commitments without restriction for all sub-sectors as far as modes 1, 2 and 3 are concerned. For Mode 4, the EC propose that further discussions be held on how to improve and facilitate the temporary movement of natural persons for the provision of specific services.

The **Canadian** proposal[26] encourages liberalization in all modes of delivery and in all sub-sectors contained in the present list of environmental services (core services) and in the other related services (non-core or dual-use services). The latter could be included in a checklist to be used as an aide-mémoire during the negotiations.

The **Swiss** proposal[27] suggests a classification of the core environmental services into seven sub-sectors very similar to those proposed by the EC: waste-water management; waste management; protection of ambient air and climate; remediation and clean-up of soil and water; noise and vibration abatement; protection of biodiversity and landscape; and other environmental and ancillary services. The list of related services would include: professional services relating to the environment; research and development relating to the environment; consultancy, sub contracting and engineering relating to the environment; and construction relating to the environment. Switzerland seeks broader specific commitments in respect of market access and national treatment mainly under Mode 3, but also under Modes 1 and 2 (where technically feasible). Liberalization of Mode 4 would be particularly important for the related services.

The **Australian** proposal[28] supports the classification suggested by the EC and encourages WTO members to use it for the negotiations on

[26] WTO, *Communication from Canada. Initial Negotiating Proposal on Environmental Services*, S/CSS/W/51, 14 March 2001.
[27] WTO, *Communication from Switzerland. GATS 2000: Environmental Services*, S/CSS/W/76, 4 May 2001.
[28] WTO, *Communication from Australia. Negotiating Proposal for Environmental Services*, S/CSS/W/112, 1 October 2001.

environmental services. It stresses the importance of liberalizing Mode 3 and calls for increased transparency of national regulations in the sector.

The proposal by **Colombia**[29] suggests the development of a model schedule for the incorporation of new services that are not included in the present classification, but which would be specific to the sector. In particular, Colombia proposes that the following services be included: implementation and auditing of environmental management systems; evaluation and mitigation of environmental impact; and advice in the design and implementation of clean technologies. The proposal urges developed countries to undertake liberalization commitments on Mode 4 so as to allow the movement of natural persons as environmental services suppliers.

Some of the proposals introduced by the developed countries illustrate the kind of trade barriers that, according to them, should be removed through the GATS negotiations: restrictions on equity holdings, requirements for joint training with a local firm, and limitations on the form of establishment. However, some of these limitations may facilitate the strengthening of domestic capacity in the environmental services sector in the host country, especially if it is a developing country. Some qualifications to market access may therefore support the capacity-building efforts of the host country and should not be regarded as trade barriers. In fact, such qualifications contribute to making the "win-win" scenario materialize.

The Doha Ministerial Declaration is adding some additional impetus to trade liberalization in the sector. It instructs countries to

[29] WTO, *Communication from Colombia. Environmental Services*, S/CSS/W/121, 27 November 2001.

negotiate "the reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services".[30]

4. Business Opportunities for Developing Countries and Actual or Potential Limitations

A. Business opportunities

Technical expertise, price, quality and reliability of services are the most crucial competitive factors in the environmental industry, but other factors, such as geographical or cultural proximity or the capacity to offer a multidisciplinary package, may also contribute to a company's competitiveness. Most of the developing countries' emerging demand for environmental goods and services is at present met by firms from developed countries, although domestic firms or firms from other developing countries may take over this task in the medium term. Strategies to create or expand business opportunities may include: (a) offering an integrated package of goods and services; (b) offering specialized services; (c) targeting regional markets; and (d) establishing links with foreign companies.

Environmental problems are often specific to given regions. Therefore, solutions should be adapted to the local situation. Firms from developing countries may be in a better position than firms from industrialized countries to address environmental problems peculiar to the developing regions. Moreover, they may be able to offer a range of products and services that compete with those offered by firms from developed countries in terms of cost and simplicity and that are perceived as more appropriate to the needs of the developing countries.

[30] WTO, *Ministerial Declaration. Adopted on 14 November 2001*, WT/MIN(01)/DEC/1, 20 November 2001

Countries in different regions but with similar environmental problems could also acquire technologies and services from companies in developing countries, thereby generating export potential. Examples of services that could be offered include: the management of rainforests; environmental management in resource-extraction industries such as mining, oil and gas or forestry products; the preservation of biologically rich ecosystems; and the reduction of air pollution in the world's largest cities. For example, Brazil, after several failures in addressing deforestation in the Amazon, seems to have identified some policy strategies – such as upholding the rule of law, securing property rights, weeding out corruption and reducing subsidies – that may help to reduce the rate of deforestation and promote economic growth. Public authorities and private firms that have been involved in the process may make their expertise available to countries in Asia or Africa that are also fighting deforestation.

The ability to offer an integrated package of goods and services or to provide multidisciplinary services makes a company more appealing in the market. Transnational waste companies that can provide integrated services are present in both developing and developed countries. The interest in contracting those companies lies in their ability to take care of waste collection, transport, disposal, recycling, composting, waste-to-energy generation, and so on.

Municipalities can be serviced by a single such company performing a series of interrelated activities. In developing countries, some firms are pursuing this business strategy. In Malaysia, a private company whose main business is to operate waste-water plants privatized by the Government is following the example of the British and French water companies and is providing integrated water services domestically and to other countries in the Asia-Pacific region. Another Malaysian company, which operates engineered water-treatment systems, has boosted its capabilities by starting a manufacturing facility. This has given the firm full capacity to not only design but also manufacture its combination of licensed and proprietary water-treatment systems. The company is expanding its

activities in Indonesia and Thailand through acquisition and is moving to the very specialized market of ultra-pure water.

Text box no. 3
The case of Brazil

Brazil was the first country in Latin America to implement a coherent package of environmental legislation. In addition, individual States developed legislation at State level, the most advanced probably being the State of São Paulo, where a public company, CETESB (Companhia de Tecnologia de Saneamento Ambiental), developed the capacity to absorb, adapt and modify environmentally sound technologies imported from the developed countries. CETESB runs training activities aimed at upgrading the technical skills of its personnel, and is responsible for approving large construction projects, after assessing their environmental impact. It runs a number of projects of great importance to the country and the region. With the cooperation of the United States Environmental Protection Agency, and using funds made available by the World Bank, CETESB has started a pilot project with a group of private firms in the State of São Paulo aimed at replacing end-of-pipe technology with cleaner technology. It has undertaken initiatives for importing and adapting to local conditions technology for cleaning up industrial sites, for the management of water resources, and for the incineration of industrial waste. It has also implemented a project to reduce air pollution from mobile sources in São Paulo. The results of these projects are relevant to other countries in the region that share the same problems, i.e. air contamination, especially in large cities, dependence on end-of-pipe technology and a limited capacity to deal with highly sophisticated technology.

CETESB has been providing consultancy services to other Latin American countries (Argentina, Uruguay, Paraguay and Mexico), has opened its training courses to technicians from foreign countries (mainly countries of the region and Portuguese-speaking African countries) and is thinking about developing a marketing strategy to sell (at market price) its services to foreign countries. The income generated by these activities would represent a new source of financing for environmental initiatives in the State of São Paulo. Some private firms are also providing environmental services abroad. The technologies and services provided by these companies may be more appealing to neighbouring countries

than those supplied by firms from developed countries because of their knowledge of environmental problems specific to the region, cultural affinities, a similar language, and greater understanding of the way in which business is carried out in the region. If Brazilian legislation becomes the basis for the development of environmental legislation in other countries of the Southern Common Market, export opportunities for both State-owned and private companies will dramatically increase.

* See Fernando Rei and Oswaldo Lucon in this volume.

However, the provision of integrated packages of goods and services is beyond the capacity of many firms in developing countries. Developing such a capacity may require forging partnerships with firms that offer complementary knowledge and technologies. In particular, by establishing links with companies from industrialized countries, firms from developing countries may be able to acquire state-of-the-art technologies, reach markets that would otherwise be difficult to access, and become part of an international network. For example, an Indonesian group, in partnership with a French water multinational, has won the concession for water management in one section of Jakarta; a California-based integrated environmental firm and its partner from the Republic of Korea have set up a joint venture geared towards treating toxic and radioactive waste and contaminated areas in the Republic of Korea, and plan to offer their services to other emerging markets in Asia. Partnerships between local companies in developing countries and foreign or transnational firms can also be beneficial for the developed partners, since they make it easier for the latter to start up activities in emerging markets, where environmental and business conditions can be quite different from those in developed countries. Partnerships seem to have contributed dramatically to enhancing technical capabilities in developing countries.

B. Actual or potential limitations

Limitations on business opportunities can be identified as relating to: (a) demand conditions; (b) supply-side considerations; (c) policy; and (d) legislation.

(a) With regard to demand conditions, the following obstacles may be noted: (i) relative stagnation of the demand for environmental goods and services in the OECD countries and insufficient financial resources to pay for environmental goods and services in developing countries; (ii) uncertainty related to payment: for firms expanding their activities in developing countries, the main risk is foreign exchange, since payments are made in local currency, and partial payment for services provided is also a risk; (iii) a changing political situation: it may happen that a newly established Government is not able to honour the terms of a contract with a private company; (iv) corruption: the public market can be particularly opaque and therefore difficult to penetrate for foreign firms that do not know the rules of the game; and (v) lack of a reliable legal system to guarantee compliance with the commitments undertaken by the parties.

(b) With regard to supply-side considerations, the following may be noted: (i) difficulties faced by small and medium-sized companies: the environmental industry is heavily represented by small and medium-sized companies that have little inclination to export, especially when faced with large companies that are well established in the international market; and (ii) lack of skilled personnel and lack of financial resources for training, especially in developing countries.

(c) With regard to policy, the following restraints may be noted: (i) preference for local firms and public procurement rules are making it difficult or even impossible in certain cases for foreign firms to deliver environmental goods and services; and (ii) there is a lack of government support in terms of business development, finance and tied aid.

(d) Finally, with regard to legislation, limitations on the movement of natural persons and on a foreign commercial presence may hinder the delivery of environmental services abroad. For instance, there may be time restrictions on the stay of experts in a foreign country, national legislation may impose limitations on imported labour (especially at the middle-management level) or a firm may face limitations related to facility ownership or company control. The regulatory process generally requires firms in the environmental services industry to obtain numerous permits to conduct various aspects of their operations, any of which may be subject to revocation, modification or refusal. The documentation, testing procedures and information-gathering requirements that may be requested for such permits can impair foreign companies' ability to obtain, retain or renew applicable permits in a timely fashion. Legislation may also create strict liability (especially for operations related to the transportation, treatment and disposal of waste), which may constitute a barrier for small companies or for companies with limited experience in this field. The market for environmental liability insurance is restricted, with only a few insurance companies currently offering limited coverage on restrictive terms and at high premiums.

However, new practices are making it possible to overcome some of the limitations included in national legislation. In particular, the use of information technology may reduce the need to spend long periods abroad to deliver a service, since most of the preparatory work (e.g. analysis of relevant legislation of the host country) can be done in the exporting country, thus making it easier to cope with limitations on the movement of natural persons. Also, new business techniques apply in the environmental sector; the build-operate-transfer (BOT) procedure is widely used in water utilities and is also becoming common in the waste segment. Under this procedure, a private firm and a public authority enter into a contract for the design, construction, operation and maintenance of a facility. Once the facility becomes operational, the public authority starts reimbursing the private firm for the costs it has incurred. After refunding capital expenditure, the public entity acquires the ownership of the facility, while it continues to pay the private firm for operating it. In this case,

the role of the private entity changes over time (i.e. from owner to manager), with a parallel modification of its legal obligations and of the limitations it may face.

5. Enhancing Domestic Capacity

A number of conditions must be satisfied if the environmental services sector is to be strengthened. The formulation of appropriate environmental legislation and the setting up of environmental authorities to enforce it are the first steps in addressing environmental problems. The way in which environmental legislation is developed is also crucial: if all the relevant stakeholders, such as the State, enterprises, non-governmental organizations and social groups, are involved, there is more likely to be support for otherwise unpopular decisions. The enforcement of environmental legislation often involves public participation. In Brazil, public hearings on environmental impact assessments initially involved only the parties directly concerned. Subsequently, environmental groups and local organizations began to join the process, making its results more widely acceptable and increasing the democratic participation in environmental policy-making. Choices that imply costs for citizens (e.g. water and waste fees) may become acceptable through the kind of process described.

The availability of ESTs and related know-how is one of the keys to environmental sustainability in developing countries. The constraints that firms face in accessing and utilizing ESTs originate from both the supply and the demand sides. Among the supply-side obstacles are the protection, or lack of appropriate protection, of intellectual property,[31] cost factors, lack of relevant information for

[31]On the one hand, stronger and broader intellectual property rights (as a result of the TRIPS Agreement) would enhance the bargaining position of technology holders vis-à-vis potential licensees. On the other hand, greater protection of intellectual property rights in developing countries may be a necessary condition for the transfer of technology. In practice, however, the

making the right choice, the fact that some ESTs are not yet marketed or marketable, time-consuming licensing procedures which add to the cost of technology, and inadequate policy and incentive measures in technology-producing countries to promote the diffusion of ESTs. On the demand side, some of the major impediments include financial constraints, lack of local capacity, lack of the skills required in order to acquire, adapt and assimilate technologies, lack of awareness and relevant information on available ESTs, and the absence of regulations, policies, incentives and the enforcement instruments to advance the utilization of ESTs.

The issue of affordability is often a major demand constraint, particularly where the economic conditions of the country to which the technology is to be transferred are very different from those of the industrialized countries where the technology has been developed and applied. For example, the size of the market and the less sophisticated distribution systems and marketing channels may mean that production costs per unit will be higher or that a high volume of production cannot be attained. The technology as applied in industrialized countries may well need to be adapted to these different conditions, a process which will also incur additional costs.

Overcoming the initial barriers to the introduction of a new technology may require public-sector funding, as deliberate efforts are required in order to create an economic and policy environment appropriate for the transfer and diffusion of ESTs and to sensitize potential users to the advantages of acquiring, adopting and assimilating ESTs.[32]

environmental industry has not identified intellectual property protection as a major problem.

[32] UNCTAD, in cooperation with UNEP and DESA, "The role of publicly funded research and publicly owned technologies in the transfer and diffusion of environmentally sound technologies", background document for the International Expert Meeting on the role of publicly funded research and

Firms that have innovative and high-quality management are better placed to play a dynamic role in technology absorption. The availability of resources for personnel training is also crucial, since the environmental industry in developed countries represents one of the largest concentrations of technical, engineering, manufacturing and management skills in the world today, but many nations in the developing world lack the technology and educational resources to match this in the short term.

The experience of Brazil confirms that public authorities can greatly contribute to capacity-building. Increased domestic capacities characterize the success stories. In the case described, the local government played a crucial role in providing the appropriate legal framework; it enhanced domestic capacity to acquire, assimilate and adapt technologies, guaranteed that the commercial interests of foreign firms holding intellectual property rights were protected, raised funds from international agencies and developed countries for personnel training, disseminated information to private firms on the advantages of using ESTs, and ensured that environmental policy decisions were the result of a participative process.

Considering that SMEs account for half of the market of environmental services, Governments in developing countries could encourage foreign firms operating in their territories to "adopt" promising domestic SMEs that are – or have the potential to become – suppliers, and assist them in the continuous upgrading of management skills and technology. The specific activities and results of such an effort would be agreed between the foreign and the domestic firms. It could be a time-limited commitment with regular reviews to ensure that specific targets are met. This calls for an investment of time and a commitment by both the foreign and the domestic firms. Possible activities may include the following: engineers and managers from the foreign firm visit the local SME on a regular basis and provide advice;

publicly owned technologies in the transfer and diffusion of environmentally sound technologies, Kyongju, Republic of Korea, 4-6 February 1998.

the foreign company assigns a few staff members to the SME for a limited period; the foreign firm offers access to its internal training programmes to the staff members of the SME; a process of continuous managerial, technological and human-resource improvement is developed and progress is assessed jointly; the foreign firm shares market information and strategy with the SME and provides it with additional business opportunities through business matching and brokering strategic alliances; the foreign firm provides special or favourable pricing for the SME's services, and helps the SME's cash flow through advance purchases and payments, prompt settlements and provision of foreign exchange; the foreign firm provides the SME with long-term financial assistance through the provision of capital and guarantees for bank loans; and funds are established for working capital, infrastructure financing and leasing.[33]

As mentioned, the main thrust of strengthening capacities in developing countries in the environmental services sector is to help them in addressing, and eventually solving, their environmental problems. This should be part of a global effort to achieve sustainable development. Moreover, strengthening capacities in the environmental services sector may lead to additional positive outcomes. For instance, developing countries could aim to make the export of environmental services a profitable activity, since they would be in a much better position to meet environmental requirements in the importing markets and could better satisfy consumers' expectations about the environmental virtues of products and related manufacturing processes. They would become more appealing destinations for foreign direct investments, have easier access to capital and strengthen other domestic sectors. The evidence also shows that countries that have made efforts to improve sanitation and waste collection and to limit air and water pollution have been rewarded by an increase in tourism.

[33] UNCTAD, *World Investment Report 2001. Promoting Linkages*, New York and Geneva, 2001, pp. 213-214.

MODERNIZING THE LIST OF ENVIRONMENTAL SERVICES: OECD PROPOSALS

Dale Andrew[*]

Introduction

In the 1990s, the OECD Industry Committee actively pursued various investigations on the environment industry. In particular, in recognition of the need to improve the collection of consistent information on production, employment, trade, investment and research and development (R&D), the OECD and Eurostat (the European Communities' Statistical Office) set up an informal working group on the environment industry in 1995. The results were published in 1999 in *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis* (hereinafter the *Manual*). Statistical agencies in a number of OECD countries have used this classification to design and carry out new surveys and studies on the environment industry about this rapidly evolving industry[1].

At about the same time, the OECD Joint Working Party on Trade and Environment (JWPTE) undertook to investigate the possibilities of "win-win" situations arising for environmental protection and economic benefits from the liberalization of trade in environmental goods and services. Using the new OECD/Eurostat state-of-the-art *Manual* as its point of departure, the JWPTE incorporated the international trade aspects. A series of studies, first on trade in environmental goods and then on trade in environmental services, led

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[1] This paper draws from a paper on environmental services presented to the UNCTAD Expert Meeting on environmental services held in July 1998. That earlier paper was drafted by Dale Andrew and Rachel Thompson.

to the publication in 2001 of *Environmental Goods and Services: The Benefits of Further Global Trade Liberalisation.*

Although this paper focuses on environmental services, it is important to emphasize that a key aspect of the OECD work on classification issues is the recognition of the *integrated* nature of the environment industry. That is to say, environmental goods and environmental services are used together in addressing particular environmental protection problems. Whereas environmental goods – equipment and technologies – are used to prevent, abate and remediate pollution or conserve natural resources, environmental services are the essential complement to research, design, produce, install, operate and upgrade such environmental equipment and technologies. Recourse to one without the other constitutes only a partial response, leading to diminished environmental performance. Accordingly, a recurring theme in the OECD analysis is the desirability of proceeding with liberalization of both environmental goods and services on a concurrent, and preferably integrated, path.[2]

1. Mapping the environment industry

In the words of one analyst, the environment industry "is less a sector than an agglomeration of providers of many types of goods, services and technologies that are usually integrated into production processes and are often hard to tease out as separate items".[3] It has been experiencing substantial structural changes, including concentration, privatization, moving from end-of-pipe to integrated

[2] This paper focuses on environmental services. For an analysis of the entire environment industry and the international trade in both environmental goods and environmental services, reference should be made to the OECD publication *Environmental Goods and Services: The Benefits of Further Global Trade Liberalisation*, OECD, 2001.

[3] United States Office of Technology Assessment (1994), *Industry, Technology and the Environment: Competitive Challenges and Business Opportunities*, OTA-ITE-586, US Government Printing Office, Washington, DC. p. 149.

and cleaner technologies, and shifts to totally new activities. At the same time, evolving emphases in environmental policy – from pollution control and remediation to policies emphasizing pollution prevention – have had profound impacts on the types of goods and services being used by the industry and entering into international trade. In this regard, the prime objective of the classification contained in the *Manual* is to provide a flexible classification framework for mapping environment industry activities which is currently accurate and useful but which also can be adapted to future needs as the industry evolves.

The complete OECD/Eurostat classification system, with an explanation of each of the three main Groups and each of the categories, is contained in an annex to this paper. An overview and summary illustration of the *Manual'*s approach is provided in table 1 in matrix form. The matrix combines the environment industry business activities of different general kinds (columns) with the related environmental industry classes (rows). These latter classes (rows) correspond to the three large *groups* and the *categories*.

Table 1. Mapping environment activities

Business activities *Environmental classes*	**Production of equipment and specific materials**	**Provision of services**	**Construction and installation of facilities**
POLLUTION MANAGEMENT GROUP			
Air pollution control			
Waste water management			
Solid waste management			
Remediation/clean-up of soil and water			
Noise/vibration abatement			
Monitoring, analysis, assessment			
CLEANER TECHNOLOGIES & PRODUCTS GROUP			
RESOURCE MANAGEMENT GROUP			

Source: OECD, *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, 1999.

Services comprise the lion's share of environment business activities. Of the US$ 518 billion estimated as the value of the global environment industry in 2000 (in the OECD publication *Environmental Goods and Services*, 2001, table 2), over two thirds is represented by services. Basic infrastructure services for waste treatment, water treatment and water supply comprise more than half.

2. Challenges in devising a classification for environmental services

As noted in the Introduction, the OECD trade and environment project sought to identify and develop a trade classification for both environmental goods and services. In outlining here the particular problems faced, we focus on the services aspects, while noting where similar issues arise also for goods.

The ***structural diversity*** of the environment industry presents definitional/classification challenges. This is due to its rapid evolution beyond traditional pollution control and remediation/clean-up activities to also incorporate a broader range of pollution management, cleaner technology and resource management activities. In such activities, environmental goods, technologies and services are increasingly offered on an integrated basis, whether "horizontally" through a firm or group of firms bringing together the range of materials and expertise required for undertaking an entire project in a particular environmental media, or "vertically" through firms specializing in, for example, construction and engineering across several environmental media.

There are also wide variations in the ***maturity and sophistication*** of the technology used in the provision of environmental services. A significant part of the industry's value is in water supply, water treatment and solid waste management, utilizing mature and basically low-tech goods and services for hauling and pumping. This low-tech end of the environmental industry overlaps with ordinary "housekeeping" functions common to many industries. As a result, it is difficult to draw a clear boundary around the environmental sector.

These factors contribute to probably the most serious definitional issue – ***multiple use***. Several environmental services, and many goods, have a multiplicity of possible commercial uses, many of which are not environmental. For services, the clearest examples are architectural and design services, engineering, construction and

installation services, land-use advisory services, R&D services, and data monitoring and technical testing services. Industry groups, particularly those organised “horizontally” across several environmental media, also mention surveying services and land and water transportation services as relevant to their environmental project-delivery capacities. It appears to be less difficult to distinguish environmental consultancy, law, education and eco-tourism services from more generic services.

Inevitably the multiple-use factor means that a definition/classification of environmental services for trade negotiations purposes must either exclude certain services with clear environmental uses or run the risk of including some sales, production, trade, etc. – in goods which are of non-environmental use.

Attempting to identify environmental services that embody particular "***cleaner" processes*** is linked to efforts to do so for "cleaner" goods and technologies. For example, a piece of equipment using a cleaner technology will have within it the ***embedded technology***, to which one can point as the "location" of the environmental protection justifying its marking as an environmental good. Cleaner technology, by definition, involves changes in production and processes upstream, rather than using add-ons or other end-of-pipe facilities downstream to separate the harmful effluents after production. Cleaner services, by implication, are those that involve ***embedded skills*** related to the use of cleaner technology, and specialist knowledge relating to upstream processes for environmental protection.

However, defining a "cleaner" service and accompanying technology in practice can be difficult. Two problems present themselves. First, ***dual motivation***. As pollution prevention options can be more economical than equivalent end-of-pipe measures, and pollution is managed as another kind of resource use, reducing costs of (polluting) resources will be factored in along with costs of other resources. In such cases, it is difficult to distinguish environmentally

motivated changes from those changes motivated by economic savings.

The definition of cleaner technologies also raises the issue of ***relativism***. A service incorporating technology that reduces use of resources or reduces pollution today may be relatively dirty in a few years' time as more advanced technologies become available. Maintaining today's "cleaner" technologies and services for an inappropriate length of time on favoured lists for, e.g. investment promotion, could delay innovation or distort investment and trade decisions towards processes that are relatively less clean than those that become available with innovation and technological progress.

3. Identifying environmental services for purposes of international trade

Services are intrinsic to the delivery both of traditional pollution control and remediation/clean-up activities and of newer techniques of pollution management, as well as to installation of cleaner technologies and resource management activities. Increased privatization of traditional environmental services, in particular water and waste treatment services, and a shift in regulatory emphasis and the behaviour of large firms, from end-of-pipe pollution control to pollution prevention and cleaner production, are having a number of important effects. These include expanding the relative importance of services in the environmental industry, stimulating private demand for and supply of environmental services, and accentuating the need for and role of service activities beyond the traditional "core" environmental services.

Furthermore, environmental products, technologies and services are increasingly provided commercially on an integrated basis, whether "horizontally" by a firm or group of firms bringing together the range of materials and expertise required to undertake an entire project for a particular environmental medium (e.g. water, air, habitat)

or “vertically”, for example, by firms specializing in construction and engineering across several environmental media.

Specialist services are therefore important in their own right for the effective utilization of environmental technologies and products in pollution and resource management projects. They are also increasingly integral to these technologies and products. This synergy suggests the desirability of pursuing liberalization of international trade in environmental services in tandem with efforts to liberalize international trade in environmental products and clean technologies.

Traditionally, environmental services have been understood and defined quite narrowly in terms of facilities that provide water and waste treatment services, often by the public sector. However, over the past decade or so, a need has been felt to move beyond this stage, owing to a combination of new regulatory requirements for the management and control of pollution, growing public sensitivity to environmental problems and privatization and liberalization trends which have created private demand for environmental services and tied them more closely to the market.

Perhaps the leading factor has been the shift in regulatory approaches, from end-of-pipe pollution control to pollution prevention through adoption of technologies for cleaner production and products, with the active involvement of the private sector. This has made a broader range of services much more important, especially for the application of design, installation, managerial, environmental auditing and engineering know-how.

In many developing countries, the emphasis on basic environmental services remains, especially for water supply and wastewater treatment, but there is also a shift towards cleaner production in both development cooperation programmes and national initiatives. Cost-effectiveness mainly drives this trend, because of the gap between the environmental needs of developing countries and the financial resources available to satisfy them. UNCTAD has noted that

developing countries have two main priorities: (a) basic human needs relating to drinking and waste water treatment, sanitation and waste management; and (b) coping with the problems of rapid industrialization and urbanization in relation to waste water, urban air pollution, and toxic and hazardous solid waste.[4]

Historically, the private sector has played only a limited role in environmental services (and hence in opportunities for international trade) because Governments largely provided the major public infrastructure services, such as water treatment and waste disposal services. This was mainly for two reasons. First, some environmental services may have the characteristics of public goods, e.g. sanitation and sweeping services for public spaces, which no single firm has an economic incentive to provide. Second, some environmental services may require comprehensive distribution or collection networks and equipment infrastructure, e.g. sewage collection systems, and the high level of investment required tends to create conditions of natural monopoly. Accordingly, until recently Governments provided such services so as to control or subsidize the cost to consumers. These two factors tended to mean that the private sector either chose not to, or was not allowed to, enter the market to provide many of these services.[5]

However, more recently, domestic and international markets for environmental services have begun to emerge. One factor is the increased trade in environment-related equipment and technology, along with associated services, to establish or upgrade industrial and public infrastructure plants, particularly for water treatment, waste management and abatement of air pollution. Another factor is the adoption of worldwide environmental standards, which can generate growth in international environmental goods and services markets, as demonstrated by the Montreal Protocol with respect to replacement strategies for CFCs (chlorofluorocarbons). A third factor has been the

[4] UNCTAD, "Services and the environment", report prepared for the UNCTAD secretariat by Paolo Bifani, UNCTAD/SDD/SER, 6 March 1996.
[5] WTO, *Environmental Services*, S/C/W/46, 6 July 1998.

decision in many countries to begin domestic privatization and to break up monopoly control of public utilities; these trends generate foreign investment and competition in services.

Nevertheless, as with environmental goods, it is difficult to delineate the precise boundaries of the environmental services sector because of definitional problems arising from multiple use and from embedded environmental technologies and skills. This is because some services provided for environmental purposes are also provided in commercial contexts that do not relate directly to improved environmental protection or performance. Examples include architectural and design services, engineering, construction and installation services, land-use advisory services, R&D services, and technical testing and analysis services. Industry groups, particularly those organized "horizontally", also mention activities such as surveying services and land and water transportation services as relevant to their environmental project-delivery capacities; yet these services, too, obviously have non-environmental uses.

As a result, the development of a framework for further liberalization of the environmental industry – as a means of stimulating deployment of urgently needed environmental technology and know-how – requires a fresh look at the definition of environmental services. It is therefore essential to compare the classification system used in the Uruguay Round with today's industry profile, as classified in the *Manual*.

3.1 Shortcomings in the existing GATS classification of environmental services

The classification of environmental services provided by the OECD/Eurostat *Manual* and the Services Sectoral Classification List MTN.GNS/W/120 (hereinafter referred to as that provided by W/120), which is used at the WTO, are very different. The *Manual* reflects an evolving, more integrated industry and identifies environmental services as those provided to measure, prevent, limit, minimize or

correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems. It encompasses services relating to pollution management, including those relating to the construction and installation of facilities for such purposes, and services relating to the installation and utilization of cleaner technologies and products and of technologies and products which reduce environmental risk and minimize pollution and resource use.

For its part, W/120, drawn up in 1990-1991 and derived from the provisional United Nations Central Product Classification (CPC) statistical classification (Provisional CPC), reflects a very traditional view of environmental services as largely public infrastructure services, i.e. services supplied to the general community, and focuses mainly on waste management and pollution control. This view persists in the recent revision of the CPC (CPC Version 1.0). The GATS and CPC classifications are set out in table 2.

Table 2. GATS and CPC classifications of environmental services

GATS Sectoral classification 6	Provisional CPC Division 94	CPC Version 1.0 Division 94
Environmental services	Sewage and refuse disposal, sanitation and other environmental protection services	Sewage and refuse disposal, sanitation and other environmental protection services
A. Sewage services	9401 Sewage services	941 Sewage services 94110 Sewage treatment services 94120 Tank emptying and cleaning services
B. Refuse disposal services	9402 Refuse disposal services	942 Refuse disposal services 94211 Non-hazardous waste collection services 94212 Non-hazardous waste treatment and disposal services 94221 Hazardous waste collection services 94222 Hazardous waste treatment and disposal services
C. Sanitation and similar services	9403 Sanitation and similar services	943 Sanitation and similar services 94310 Sweeping and snow removal services 94390 Other sanitation services
D. Other	9404 Cleaning services of exhaust gases 9405 Noise abatement services 9406 Nature and landscape protection services 9409 Other environmental protection services n.e.c.	949 Other environmental protection services n.e.c.

The environmental services sector, as defined in W/120, was not a focus of the Uruguay Round services market access negotiations. This may account at least in part for the limited sectoral classification used: the main CPC headings were generally carried over to W/120. In some other sectors, such as financial services and telecommunications services, which received much greater attention, W/120 is much more closely related to how companies conduct their business and the services they provide.

Nevertheless, most OECD member States and some developing countries made at least some commitments under one or more of the four W/120 sub-sectors of sewage services, refuse disposal services, sanitation and similar services, and "other" environmental services.[6] It should also be noted that the Uruguay Round services negotiators, in constructing the first multilateral trade framework for services in the early 1990s, sought guidance from the Provisional CPC, which, at the time, was the best available tool. However, the CPC was not developed or intended as a basis for trade negotiations. The GATS negotiators were concerned that the GATS sectoral classification system should be a manageable and practical negotiating tool, readily linkable to national services statistics classifications, while covering commercially significant sectors in international services trade.

Therefore, and as with the CPC system, the GATS sectoral classifications are intended to be self-contained and, insofar as possible, mutually exclusive. A strong feature of recent discussions on whether the GATS classification system should be updated for the mandated new round of GATS negotiations is the widespread view among WTO members, particularly developing countries, that there is a need for stability. Therefore, overhauling of the GATS sectoral classification needs to be justified by significant evolution in the

[6] A description of the scope of existing GATS market access and national treatment commitments for the four GATS environmental services sub-sectors is provided in the OECD publication *Environmental Goods and Services*, 2001, annex IV.

sector concerned, including in the scope of services being traded internationally.

This is indeed the case for environmental services. A close examination of the correlated CPC descriptions indicates that W/120's classification of environmental services is unduly narrow for a number of reasons.

First**,** it is not clearly organized according to the provision of services for specific environmental media (water, solid waste, air, noise, soil, habitat, etc.). Yet many environmental services providers specialize in one or more environmental media and provide comprehensive service packages for those media. Thus, while there is some correlation between the primary environmental media and W/120's main categories of sewage, refuse disposal, sanitation and "other" environmental services, it is only partial, especially in the case of water and solid waste management. For example, there is more to water management, water purification, waste water treatment and water recycling than "sewage services". Furthermore, the W/120 categories of refuse disposal and sanitation services are sub-sets of a missing broader category of solid waste management, in which recycling and sophisticated storage strategies should be core environmental service activities (instead, these services are partially covered elsewhere in W/120).

Second**,** the focus of the W/120 classification is on traditional "end-of-pipe" approaches, with little or no coverage of pollution prevention and sustainable resource management services. As a result, some key services are not explicitly covered in W/120 (e.g. remediation of polluted or contaminated soils and water ecosystems, ecological research and consultancy, collection of paper, plastic, glass and metal waste for recycling, hazardous waste collection and storage).

Third, W/120 covers the services provided in the operation of certain facilities, plant and equipment, but not the design, engineering,

R&D and consulting services that create and upgrade them, or the engineering, installation and construction services and technical testing and analytical services that make them operable. While these services are integral to environmental "value adding" and the international transfer of environmental technology, skills and know-how, they are classified elsewhere in W/120.

Fourth**,** the W/120 classification mainly focuses on utility/infrastructure services supplied to the general community and largely overlooks the provision of environmental services directly to industry. The heterogeneous nature of the entities providing environmental services is also pertinent, insofar as they tend to cut across the "vertical" sectoral lines of the CPC/GATS classifications and involve both public and private sector actors, which may be either "vertical" functional specialists or "horizontal" service providers.

These factors make it desirable to consider ways to modernize W/120 while preserving the "self-contained sectoral structure" of the GATS classification. As a first step in analysing how this could be done, table 3 presents a comparative chart of the OECD/Eurostat classification and the W/120 sectoral list. The OECD/Eurostat classification helps to delineate the boundaries of the sector, in terms of covering services provided for environmental protection, pollution control, remediation or prevention activities and services provided for activities relating to specific environmental media. An effort was made to match practical descriptions/examples of such services to W/120 and the associated Provisional CPC and CPC Version 1.0 codes. This helps to reveal those services that are "uniquely" environmental in nature, as distinct from those services that have "dual" uses (i.e. that have both environmental and non-environmental uses and thus tend to be covered in W/120 under other sectoral headings).

Table 3 gives a picture of environmental services provided directly to industry alongside those provided as "public infrastructure", as well as the range of services that design, install, operate, maintain and

upgrade the equipment and technologies involved, the "support" services involved in R&D, testing, analysis and monitoring, and the range of recycling and remediation services. It makes it clearer how environmental services are actually provided. For example, it covers all of the services involved in build-operate-transfer (BOT) projects for water supply and treatment or for solid waste management, a key means of delivering new environmental services in many parts of the world, particularly in developing countries.

The aim of table 3 is to show the range of services involved in the environmental industry, not to suggest that this should be adopted as a new GATS classification for environmental services. Rather, it provides the overview of the environmental services industry necessary for helping trade policy makers make informed decisions about how to modernize the existing GATS classification.

3.1.1 Modernizing GATS classification of environmental services on the basis of "end use"

In devising modernized GATS classifications, it is essential to maintain clear boundaries between the principal sectors in order to preserve the integrity of GATS specific commitments made under the existing classification system. This is a challenge because of the commercial scope of environmental services provision. "Dual use" is a key issue for determining the boundaries of the environmental services sector. A number of services that, in commercial terms, are regarded as "environmental" in nature also have non-environmental uses, and are provided as such by non-environmental service firms and are classified elsewhere in W/120.

The most frequently occurring services in the latter group include:

- Design, architectural and engineering services;
- Site investigation and surveying services;
- Research and development services;

- Data monitoring and technical testing services;
- Construction, installation and related engineering services;
- Distribution services (regarding aspects of recycling);
- Education and training services provided outside the school and university systems.

From a commercial point of view, therefore, the question arises of the feasibility in the GATS context of constructing a new classification for environmental services that incorporates the "environmental elements" of these services, based on the circumstances in which they have an environmental end use. In practical terms, a service's end use is defined by the customer's purpose and requirements in commissioning a service. This also helps to shape a service's characteristics in terms of the skills and technologies deployed. Thus, services with the same end use and similar characteristics are likely to be directly competitive or substitutable in the market place.

On the face of it, it should be possible to envisage a GATS classification for environmental services that makes possible the incorporation of specifically environmental end-use services, such as design and architecture services for the construction of waste management facilities, environmental education services for public awareness campaigns, computer modelling services and data-gathering and testing services for the monitoring and prevention of maritime pollution. Such an approach would involve providing clear descriptions of the specifically environmental aspect of a service under an environmental services sectoral classification and excluding these from any other "generic" classification in the GATS system.

Table 3. Environmental services: Comparison of OECD/Eurostat and GATS/CPC descriptions and classifications

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
(I) Services provided for one or more environmental protection, pollution control, remediation or prevention activity *			
Design consulting and Engineering	Engineering services for environmental plant, equipment and facilities, including consulting services, e.g. feasibility studies, costing • Architecture and design services for environmental plant, equipment and facilities, including related urban planning and landscape architecture • Environmental impact studies	**GATS** 1A (d), (e), (f), (g): architecture, engineering, urban planning, etc., services **CPC** 86711, 86712, 86721, 86722, 86724, 86725, 86726, 86732, 86733, 86741, 86742 **GATS** 6D: other ES **CPC** 9409	83131, 832, 833 94900
Preparation of sites and construction, installation and assembly, repair and maintenance	For environmental facilities, plant and equipment, e.g. sewage and water management, solid and hazardous waste collection and treatment systems, landfill and incineration sites, etc. • Engineering services relating to site preparation; inspection during construction • Surface and subsurface surveying • Site investigation,	Not fully covered by **GATS** 6A-D: operation of the facilities, etc. (see below) **GATS** 1A (e), (f): architecture, engineering) **CPC** 86713, 86714, 86727, 86729 **GATS** 1A (e), (f) **CPC** 86752, 86753 **GATS** 3E: other	83131, 832, 833 83520, 83530

* Services for the operation of systems, plant and facilities for specific environmental media are covered in the second part of this table.

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	formation and clearance • Construction, installation and assembly of environmental utilities, plant and equipment (e.g. laying of sewers and water pipelines, construction of treatment plants, construction of landfills and other disposal sites) • Installing septic systems and disposal fields • Construction and installation work on buildings • Repair and maintenance of machinery and equipment	construction **CPC** 511, 515, 518 **GATS** 3B: construction work for civil engineering **CPC** 51340, 51350 **GATS** 3C: installation and assembly **CPC** 51620, 88590 **GATS** 6A&D: sewage services and other ES **CPC** 9401, 9409 **GATS** 3A, D: building construction, completion and finishing **CPC** 512, 517 **GATS** 1F (n): maintenance & repair of equipment **CPC** 88620	54241, 54251, 541, 542, 543, 544, 545, 546, 547, 548 54342, 86590 94110, 94900 542, 547 87159
Project management services	• Supervision of design, engineering and construction and installation, as an integrated project	**GATS** 1A (f): integrated engineering	83322, 83323, 83329
Environmental research and development	• Scientific and technological activities to develop cleaner products, processes and technologies • Scientific and technological activities to reduce or eliminate	**GATS** 1C: R&D services **CPC** 85101, 85103, 85109, 85202, 85300, 8530	81110, 81130, 81190, 81220, 81300, 8130

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	emissions and improve environmental quality Research to improve knowledge of eco-systems and the impact of human activities on the environment	**GATS** 6D: other ES **CPC** 9409	94900
(l) Services for one or more environmental protection, pollution control, remediation or prevention activity (cont'd.)			
Analytical services, data collection, testing, analysis and assessment	• Environmental monitoring, control and damage assessment services, e.g. acid rain, natural disaster assessment and abatement services • Composition and purity testing and laboratory analysis services (e.g. for health, safety and toxicology purposes) • Computer modelling of pollution effects • Sampling and monitoring of air and water quality • Forestry assessment and damage abatement services	**GATS** 6D: other ES **CPC** 9409 **GATS** 1F (e): technical testing and analysis service **CPC** 86761 **CPC** 75440, 8672 **GATS** 1F (e) **CPC** 8672, 8676, 9409 **GATS** 1F(f): services incidental to agriculture, hunting, forestry **CPC** 881	94900 83561 83139, 8339 8313, 8339, 8351
Remediation and clean-up of soil, surface water and groundwater	Operation of systems or provision of other services to reduce the quantity of polluting materials in soil or water, including	**GATS** 6D: other ES **CPC** 94060	94900

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	surface, groundwater and seawater: • Consultancy and engineering services for assessment • Use of clean-up systems *in situ* or mobile, emergency response, spills cleanup; natural disaster assessment and abatement services • Treatment of water and dredging residues • Specialized treatment of polluted soils: see solid waste management	**GATS** 6B: refuse services **CPC** 9402	94222
Eco-system and landscape protection services	• Consultancy and assessment services for ecological system, nature and landscape protection services, e.g. lakes, coastlines and coastal waters, wetlands, dry land, etc., including fauna, flora and habitats	**GATS** 6D: other ES **CPC** 9406 and 9409	94900
Environmental education, training and information	• Environmental education or training by specialized institutions or specialized suppliers provided outside the	**GATS** 6D: other ES **CPC** 9409	94900

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	school/university system for the general public or specific workplaces, e.g. training courses on environmental protection or operation of environmental facilities • Adult education and specific-subject education courses not defined by level of pupil	**GATS** 5D, E: adult and other education **CPC** 924, 929	929
(II) Services provided for specific environmental media			
Water and wastewater management **(a) Sewage services**	Including "horizontal" services in section (I) • Operation and maintenance of facilities and equipment for sewage removal, sewage treatment and disposal, tank emptying, cleaning and servicing, transport of wastewater	**GATS** 6A&D **CPC** 9401, 9409	94110, 94900
(b) Water for human use	• Potable water collection, purification treatment and distribution through mains	**CPC** 18000, 7139	69210
Solid and hazardous waste management **(a) Refuse disposal services**	Including "horizontal" services in section (I) • Collection and transport, treatment and disposal services for household, commercial and industrial trash,	**GATS** 6B **CPC** 9402	94211, 94212, 94221, 94222

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	rubbish and waste (non-hazardous and hazardous) • Treatment and disposal by incineration, dumping, composting, landfill or storage. Includes waste reduction services and specialized treatment of polluted soils. *Excludes* dealing and wholesale services of waste and scrap – see below		
(b) Recycling services	• Metal waste and scrap recycling services, on a contract or fee basis, e.g. recycling of aluminium and steel • Non-metal waste and scrap recycling services, on a contract or fee basis, e.g. recycling of paper, plastic and glass • Dealing, wholesale and retail services for recycled waste, scrap and other material, e.g. sale of paper, cans or bottles for recycling	**GATS** 1F(i): services incidental to manufacturing **CPC** 88493 **CPC** 88493 **GATS** 4: distribution services **CPC** 62118, 62278, 62113, 63299	86931 86392 61195, 61295, 62495, 62595
(c) Sanitation services	• Street, park, beach and other	**GATS** 6C **CPC** 94030	94310,

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
	outdoor sweeping, snow and ice removal, other sanitation services, e.g. drain unblocking *Excludes* disinfecting and extermination services for buildings, etc., and pest control services in connection with agriculture		94390
Air pollution control, including "horizontal" services in section I	Services for the assessment, treatment and/or removal of exhaust gases and particulate matter from both mobile and stationary sources: • Emission monitoring and control services • Concentration monitoring, control and reduction services of pollutants in ambient air, especially in urban areas • Cleaning of exhaust gas systems of vehicles, commercial and industrial buildings and complexes	**GATS** 6D: other ES **CPC** 94040	94900
Noise and vibration abatement, including "horizontal" services in	Services for the assessment, reduction or elimination of noise and vibration both at source and dispersed: • Noise pollution	**GATS** 6D: other ES **CPC** 94050	94900

Service type	Examples/ Descriptions	GATS and Provisional CPC	CPC Version 1.0
section I	monitoring, control and abatement • Design, management, etc., of systems for acoustic and soundproof screening and covering		

Sources: OECD, based on OECD/Eurostat descriptions, GATS Classification List (MTN.GNS/W/120), Provisional CPC and CPC Version 1.0 and APEC environmental services work programme.

However, because of the number of "dual use" services involved in providing environmental services, many countries feel that this would entail unacceptable intrusion into the other GATS W/120 sectoral classifications, particularly those for business and professional services, construction services and education services. These countries suggest that this could have unwanted implications for the stability and predictability (and legal interpretation) of existing specific commitments made by GATS members in these sectors. It would also require development of clear criteria that could be consistently applied for determining when a "dual use" service may be said to be an "environmental" service (that is, used for environmental purposes), as a basis for determining the "likeness" or "unlikeness" of services with environmental end uses and those without. Given the difficulties involved, an alternative approach may be considered, and is outlined below.

3.1.2 The "core" plus "intrinsically related" approach to GATS classification

As an alternative to an "end use" approach, consideration is also being given in the GATS negotiations to using the emerging industry profile, as presented in table 3, to develop general descriptions of "core" environmental services that reflect modern requirements and

commercial realities.[7] This could form the basis for efforts to update the W/120 sectoral classification for environmental services to cover, for example, the range of water-related environmental services, instead of simply "sewage services". Future GATS negotiations in this area could then be undertaken using the updated "core" environmental services classification with due attention being given to the "intrinsically related" (but separately classified) services which are crucial to the delivery of the "core" services. The focus in the first instance would be on securing agreement on the list of services covered and their description, and then on reaching consensus to use it as the basis for a package of commitments. Thereafter, the task of correlating such a package with existing commitments (and associated CPC numbers) would essentially be a technical exercise.

Alongside a modernized list of the "core" environmental services, a list of services could also be drawn up showing the "intrinsically related" (but separately classified) services which are crucial to the delivery of the "core" services. As table 3 illustrates, such a list is likely to need to focus on architectural and engineering services (including design and project management services), computer modelling services, analytical and testing services, and construction services. This second approach to modernizing the existing GATS classification for environmental services has the advantage of not departing significantly from its underlying link to the CPC system or the vertical divisions between sectors.

Whatever the approach adopted, it is clear that the existing classification is inadequate and needs to be supplemented by modernized descriptions, including checklists of updated "core" and "intrinsically related" services, even if the latter continue to be covered by other GATS sectoral classifications.

[7] Table 4 sets out key features of the OECD work and of the various Communications on environmental services submitted by six WTO Members between 1999 and 2001. For full details, reference should be made to the Members' Communications, available at http://www.wto.org.

3.1.3 Implications for developing countries of a broader classification for environmental services liberalization

As UNCTAD's forward-looking work in this sector has already shown, the needs and interests of individual developing countries with regard to environmental services vary considerably, depending on the stage of industrial development, the priority attached to environmental protection, the environmental regulatory framework and domestic financing capabilities. Needs for basic water supply, water and waste treatment are still very great in many developing countries, even those countries that have experienced high growth and industrialization in the past two decades; these in turn having created the need for pollution management and remediation at both industrial and social levels. Thus end-of-pipe environmental solutions may yet be expected to dominate the needs of many developing countries, since some, for example, in Asia, Latin America and North and Southern Africa, also have a need for new and more efficient industrial processes based on cleaner technologies. Redesigning industrial plants nearly always involves savings of energy and other inputs, and concomitantly less pollution and waste.

Nonetheless, the environmental and development benefits of technology and skills generated by open trade and investment are likely to be delivered on the integrated basis described in the preceding sections, specifically through the diffusion of skills and technology inherent in environmental engineering, R&D, analytical and education and training services.

It is considered that the environmental and development benefits of liberalization in environmental services, broadly defined, flow from the following:

1. Trade and foreign investment providing the most direct channel for environmental technology and skills transfer;
2. The resulting competitive price effects helping limited domestic environment budgets go further;

3. The provision of market-based incentives for technological progress and investment in technology, particularly by domestic industry, thereby increasing local capabilities for domestic innovation and adaptation to global product standards, with export-market flow-on and overall indirect welfare gains;
4. Improvement of health and local environmental conditions through increased access to basic infrastructure, such as safe drinking water and waste management.[8]

To this listing may be added another, crucial benefit – *jobs***.** The prevailing pattern in developed markets for exports of environmental equipment and related services involves local hiring of large numbers of workers, rather than the importation of their entire workforce requirements. This applies for both the construction/installation and operation of equipment and physical facilities in particular, and also for a range of specialist professionals with local knowledge and languages. With regard to the latter, developing countries typically possess significant human capital in relevant areas, for example in the engineering profession, natural sciences and business administration.

In these practical terms, a broader classification of environmental services that includes the services that rely on specific environmental technologies and skills and provides for their diffusion more broadly within an economy (i.e. across industry, rather than simply via specific utilities) can therefore help developing countries to improve domestic environmental performance, provide basic services such as potable water and sanitation, extend their broader domestic services capacities and increase their own exports of environmental services.

[8] See the OECD publication *Environmental Goods and Services*, 2001, reporting on a series of case studies of "win-win" benefits from liberalization of water and waste management services markets in developing economies (pp. 53-60 and annex 7).

Table 4. Comparison of OECD proposals made in the WTO to update classification of environmental services

	Objectives	Core services	Related services
OECD[1]	Preserve the self-contained sectoral lines of W/120 Revision of the classification of environmental services: • Modernize the "core" environmental services list • Include a list of "intrinsically related" services Factors to be taken into account: • Organize environmental services according to specific environmental media • Focus not only on traditional "end-of-pipe" approaches, but also on pollution prevention and sustainable resource management services • Focus not only on utility/ infrastructure services but also on the provision of services directly to industry • Consider services that	Update the W/120 sectoral classification and introduce some new items List: • Sewage services> water services for human use and wastewater management • Refuse disposal services> non-hazardous and hazardous solid waste management • Cleaning services for exhaust gases> services for protection of air quality and climate • Noise abatement services-> noise pollution prevention, abatement and control • Nature and landscape services > protection of biodiversity and habitat • New item: remediation and prevention for polluted soil and water • New item: services for sustainable resource use • Update other environmental services	Elaborate a list of "intrinsically related" services which are crucial to the delivery of "core" services • Design, architectural and engineering services • Site investigation and surveying services • Research and development services • Data monitoring and technical testing services • Construction, installation and related engineering services • Distribution services • Education and training services

	Objectives	Core services	Related services
	have dual uses		
EC[2]	Preserve exclusive nature of W/120 while addressing the following problems: new classification of "purely" and "core" environmental services and add "cluster" services (checklist)	New core list: • Water for human use and waste water management • Solid/hazardous waste management • Protection of ambient air and climate • Remediation and clean-up of soil and water • Noise and vibration abatement • Protection of biodiversity and landscape • Other environmental & ancillary services	"Cluster" services: • Business services with an environmental component • R&D with an environmental component • Consulting, contracting and engineering with an environmental component • Construction with an environmental component • Distribution with an environmental component • Transport with an environmental component. • Others with an environmental component.
Australia	Support EC proposal Highlight the fact that the core services presented in the EC proposal closely resemble the first category of the first category of the OECD/Eurostat classification: pollution management activities	See EC	See EC
Colombia	Support EC proposal Take into account private enterprise management approach	See EC	In addition to EC list, consider: • Implementation and auditing of environmental management

	Objectives	Core services	Related services
			systems • Evaluation and mitigation of environmental impact • Advice in the design and implementation of clean technologies
United States	Current classification fails to account for how businesses operate and focuses on "end-of-pipe" clean-up services without considering pollution prevention Support proposals which incorporate the current core list and add environmentally related sectors	Maintain current core list	List of environmentally related services: • Construction • Engineering • Consulting • Professional services • Business services
Canada	Proposal: maintain current core list and consider cluster environmental services	Maintain current core list	Cluster services: • Technical testing and analysis • Scientific and technical consulting • Engineering • Construction
Switzerland	Need to shift from "end-of-pipe" approach to prevention Expand core list and add related services	New core list: • Waste water management • Waste management • Protection of ambient air and climate • Remediation and clean-up of soil and water • Noise and vibration abatement • Protection of biodiversity and landscape • Other environmental and ancillary services	Related services: • Professional services relating to the environment • Research and development relating to the environment • Consultancy, sub-contracting & engineering relating to the environment • Construction relating to the environment

Source: OECD Secretariat on the basis of *Environmental Goods and Services: The Benefits of Further Global Trade Liberalisation*, OECD (2001) and Communications submitted in WTO: EC-S/CSC/W/25, 28-09-99, S/CSS/W/38, 22-10-00; Australia-S/CSS/W/112, 1-10-01; Colombia-S/CSS/W/121, 27-11-01; United States-S/CSS/W/25, 18-12-00; Canada-S/CSS/W/51, 14-03-01; Switzerland-S/CSS/W/76, 04-05-01.

ANNEX

OECD/EUROSTAT ENVIRONMENTAL GOODS AND SERVICES INDUSTRY MANUAL CLASSIFICATION

A. The "POLLUTION MANAGEMENT" group

Environmental equipment and specific materials

Air pollution control

This class includes any activity that produces equipment or specific materials for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources. It includes air-handling equipment, dust collectors, precipitators, filters, catalytic converters, chemical treatment and recovery systems, specialized stacks, incinerators, scrubbers, odour control equipment, and environmentally less-damaging specialized fuels.

Wastewater management

This class includes any activity that produces equipment or specific materials for the collection, treatment and transport of wastewater and cooling water. It includes pipes, pumps, valves, aeration equipment, gravity sedimentation equipment, chemical treatment and recovery equipment, biological recovery systems, oil/water separation systems, screens/strainers, sewage treatment equipment, wastewater reuse equipment, water purification equipment and other water handling systems.

Solid waste management

This class includes any activity that produces equipment or specific materials for the collection, treatment, transport, disposal and recovery

of hazardous and non-hazardous solid waste. It includes waste storage and treatment equipment (thermal, biological, chemical), waste collection equipment, waste disposal equipment, waste handling equipment, waste separation and sorting equipment, recovery equipment and recycling equipment. It also includes equipment for outdoor sweeping and watering of streets, paths, parking lots, etc. It includes equipment, technology or specific materials for the treatment of low-level nuclear waste. It excludes materials for the treatment of high-level nuclear waste. Recycling activities exclude production of equipment or specific materials for the manufacture or production of new materials or products from waste or scrap and subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that produces equipment or specific materials to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes absorbents, chemicals and bioremediators for cleaning up, as well as cleaning-up systems either *in situ* or in appropriate installations.

Noise and vibration abatement

This class includes any activity that produces equipment or specific materials to reduce or eliminate the emission and propagation of noise and vibration, both at source and dispersed. It includes mufflers/silencers, noise deadening material, noise control equipment and systems vibration control equipment and systems.

Environmental monitoring, analysis and assessment

This class includes any activity that produces equipment or specific materials for the sampling, measurement, and subsequent recording, analysis and assessment of various characteristics of environmental media. It includes measuring and monitoring equipment, sampling

systems, data acquisition equipment, and other instruments or machines for measurement. Environmental information systems, analytical software, specific safety and personal protection for environmental purposes are included.

Other

This class includes any activity that produces equipment or specific materials to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class. These activities should be separately specified and listed.

Environmental services

Air pollution control

This class includes any activity that designs, manages systems or provides other services for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources.

Wastewater management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment and transport of wastewater and cooling water. It includes design, management or other services for sewage treatment systems, wastewater reuse systems and water handling systems.

Solid waste management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment, management, transport, storage and recovery of hazardous and non-hazardous solid waste. It includes design, management or other services for waste handling (collection, transport, separation, sorting and disposal),

operation of sites, recycling (including collection of waste and scrap), and operation of recycling plants. It includes services for outdoor sweeping and watering of streets, paths, parking lots, etc. Services for the treatment of low-level nuclear waste are included. It excludes services for the treatment of high-level nuclear waste. It also excludes services for the manufacture of new materials or products from waste or scrap and the subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that designs, manages systems or provides other services to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes cleaning-up systems either *in situ* or in appropriate installations, emergency response and spills clean-up systems. Treatment of water and dredging residues are included.

Noise and vibration abatement

This class includes any activity that designs, manages systems or provides other services to reduce or eliminate the emission of noise and vibration, both at source and dispersed. It includes design, management or other services for acoustic and soundproof screens and street covering.

Environmental R&D

This class includes any systematic and creative activity concerned with the generation, advancement, dissemination and application of scientific and technological knowledge to reduce or eliminate emissions in all environmental media and to improve environmental quality. It includes non-technological research to improve knowledge about ecosystems and the impact of human activities on the environment.

Environmental contracting and engineering

This class includes any activity that investigates feasibility, designs and manages environmental projects not included elsewhere. It includes multidisciplinary environmental contracting and engineering. Environmental management consulting, other environmental consulting services and environmental audit services are included.

Analytical services, data collection, analysis and assessment

This class includes any activity that designs, manages systems or provides other services to sample, measure and record various characteristics of environmental media. It includes monitoring sites, operating both singly and in networks, and covering one or more environmental media. Health, safety and toxicology studies and analytical laboratory services are included. Weather stations are excluded.

Education, training and information

This class includes any activity that provides environmental education or training or disseminates environmental information, and is executed by specialized institutions or other specialized suppliers. It includes education, training and information management for the general public, and specific environmental workplace education and training. The activities of the general educational system are excluded.

Other

This class includes any activity that provides services to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class (e.g. general public administration, if it provides specific environmental services not elsewhere classified). These activities should be separately specified and listed.

Construction and installation

This class includes any activity for the construction and installation of facilities for: air pollution control; wastewater management; solid waste management; remediation and clean-up of soil, surface water and groundwater; noise and vibration abatement; environmental monitoring, analysis and assessment; other environmental facilities.

B. The "CLEANER TECHNOLOGIES AND PRODUCTS" group

This group includes any activity which continuously improves, reduces or eliminates the environmental impact of technologies, processes or products.

Cleaner/resource-efficient technologies and processes

These are cleaner and resource-efficient technologies which decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimize waste disposal problems, or some combination of these.

Cleaner/resource-efficient products

These are cleaner or resource-efficient products which decrease material inputs, improve product quality, reduce energy consumption, minimize waste disposal problems, reduce emission during use, or some combination of these.

C. The "RESOURCE MANAGEMENT" group

Note: In the case of the "Resource Management" group, activities aimed at the production of environmental goods and services and related construction are grouped together for

convenience. However, it is suggested that, wherever possible, information on these items be separately collected and presented under separate headings for equipment, services and construction.

Indoor air pollution control

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the treatment and renewal of indoor air to remove pollutants. It excludes air-conditioning.

Water supply

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for water supply and delivery systems, both publicly and privately owned. It includes activities aimed at collecting, purifying and distributing potable water to household, industrial, commercial or other users.

Recycled materials

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for manufacturing new materials or products, separately identified as recycled, from waste or scrap.

Renewable energy plant

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the generation, collection or transmission of energy from renewable sources, including solar, wind, tidal, geothermal or biomass sources.

Heat/energy saving and management

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services to reduce heat and energy use or minimize heat and energy loss (e.g. co-generation). It includes equipment, technology or specific materials to reduce climate change.

Sustainable agriculture and fisheries

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for systems which reduce the negative environmental impact of agriculture and fishery activities. It includes biotechnology applied to agriculture and fishery activities.

Sustainable forestry

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for programmes and projects for reforestation and forest management on a long-term sustainable basis.

Natural risk management

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for systems to prevent or reduce the impact of natural disasters (storms, floods, volcanic eruptions, etc.).

Eco-tourism

This class includes any activity that designs, constructs, installs, manages or provides other services for tourism that involves protection and management of natural and cultural heritage, or

education and interpretation of the natural environment, and that does not damage or degrade the natural environment.

Other

This class includes any activity that measures, prevents, limits or corrects environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, which is not included in any other class (e.g. nature conservation, habitats and biodiversity). These activities should be separately specified and listed.

Source: OECD, The Environmental Goods and Services Industry: Manual for Data Collection and Analysis, 1999, annex 1.

THE ENVIRONMENTAL INDUSTRY AND THE PROSPECTS FOR BUILDING CAPACITY IN DEVELOPING NATIONS:

Current situation and trends in the environmental industry and options for developing countries in developing capacity and export competitiveness in environmental services

Grant Ferrier*

Introduction

This paper presents a perspective on the present situation and trends in global markets for environmental goods and services; developments in environmental trade; business approaches of competitors in the environmental industry; and options in exports and imports for developing countries in the global environmental industry.

The provision of environmental services plays a crucial role in establishing and maintaining the quality of life for citizens of every nation of the world. Environmental services also are essential for creating an infrastructure for the operation of commercial and industrial enterprises that serve as the basis of a nation's economy.

While historically the basic environmental services of provision of potable water, sewage and solid waste removal have been provided by the Government as a "public good", these services are increasingly

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being provided by private companies in the developed world. In the developing world, on the one hand many nations are faced with the social realities of the costs of environmental degradation, while on the other hand they encounter the economic realities of paying for the establishment of an infrastructure to provide basic environmental services. This leads to an inevitable central question as to whether Governments should provide environmental services or whether private entities should be encouraged to be in the business of providing basic environmental services to the citizens of a developing nation.

The broader question of privatization of environmental services aside, the main objective of this paper is to provide a perspective on what the environmental industry is, how big it is, and what its main companies, market drivers and trends are, and subsequently to use this perspective to assess how developing countries can strengthen their capacity to address their own environmental problems and potentially export this capacity to other nations.

This paper has the following components:

- Definition and analysis of the environmental industry, with special emphasis on the environmental services segment;
- Size of the global environmental industry by region and segment;
- A listing of the main companies;
- Market drivers of the environmental markets in developing and developed nations;
- Trends in the environmental industry;
- Profiles of selected developing country markets as examples of market evolution and capacity development of environmental industries;
- Opportunities for developing country firms in terms of (a) strengthening their capacity to address and solve their domestic

environmental problems, and (b) becoming international providers and exporters of environmental services;

- Regarding capacity building and potential for export in developing nation environmental industries, the issue of potential reduction of elimination of trade and non-trade barriers to environmental goods and services is addressed.

1. Background on the Environmental Industry

Before presenting and discussing any detailed numbers on the global environmental market, it is vital to go through the exercise of industry definition. Just what is the environmental industry? Environmental Business International Inc. (EBI, San Diego, California, United States) has undertaken the defining, classifying and quantifying of the environmental industry since 1987. Prior to that time the industry had yet to be characterized or analysed as a whole, but existed rather in disconnected segments.

The environmental industry's environmental infrastructure base (primarily through the provision of traditionally municipal services) is certainly not new. While often referred to as an emerging sector, the industry has its roots in water delivery systems (going back to the aqueducts of Rome), sanitation engineering (sewage infrastructure) and waste management (refuse collection).

With the creation of the United States Environmental Protection Agency in 1970 and the introduction of environmental legislation, regulation and enforcement in many other developed economies over the following two decades, new breeds of private business activity emerged. These included air pollution control equipment, environmental consulting and engineering services, sophisticated environmental instrumentation and testing services, hazardous waste management and remediation or clean-up services.

2. Defining the Environmental Industry

Environmental industry activities can be divided into three major categories, depending on the dominant source of revenue generation for the entities in question:

- Service segments are operations that obtain their revenues from collecting fees for services rendered.
- Equipment segments are manufacturers that obtain their revenues from the sale of equipment.
- Resource segments are entities that obtain their revenues from the sale of a resource (like water or energy) or reclaimed materials (like metals or paper).

Table 1 provides a concise yet inclusive definition of the environmental industry, by these three categories and by fourteen business segments. It is worth noting that this evolving structure is lumped into business segments and has always sought to be consistent with traditional industry analysis along the lines of standard industry classification (SIC) or harmonized codes of types of companies. (EBI performs almost 2,000 surveys in its annual "census" of mostly United States environmental companies.) This structure is mostly consistent with OECD guidelines drawn up in the past few years with EBI input, the most important exception being the inclusion of construction costs in OECD's figures.

Table 1. Environmental industry definition and segments

Segment	Description	Examples of clients
Environmental services		
Environmental testing and analytical services	Provide testing of "environmental samples" (soil, water, air and some biological tissues)	Regulated industries, government environmental consultants, hazardous waste and remediation contractors
Wastewater treatment works	Collection and treatment of residential, commercial and industrial wastewaters. Facilities are also known as sewage treatment plants or publicly owned treatment works (POTWs)	Municipalities, commercial establishments and all industries
Solid waste management	Collection, processing and disposal of solid waste and secondary materials	Municipalities and all industries
Hazardous waste management	Manage ongoing hazardous waste streams, medical waste, and nuclear waste handling	Chemical companies Petroleum companies Government agencies
Remediation/industrial services	Physical clean-up of contaminated sites, buildings and environmental cleaning of operating facilities	Government agencies Property owners Industry
Environmental consulting and engineering (C&E)	Engineering, consulting, design, assessment, permitting, project management, O&M, monitoring, etc.	Industry, government municipalities, waste management companies, POTWs

Environmental equipment		
Water equipment and chemicals	Provide equipment, supplies and maintenance in the delivery and treatment of water and wastewater	Municipalities and all industries
Instruments and information systems	Produce instrumentation for the analysis of environmental samples; includes info systems and software	Analytical services, government-regulated companies
Air pollution control equipment	Produce equipment and technology to control air pollution; includes vehicle controls	Utilities, waste-to-energy industries, auto industry
Waste management equipment	Equipment for handling, storing or transporting solid, liquid or hazardous waste. Includes recycling and remediation equipment	Municipalities Generating industries Solid waste companies
Process and prevention technology	Equipment and technology for in-process (rather than end-of-pipe) pollution prevention and waste treatment and recovery	All industries
Environmental resources		
Water utilities	Selling water to end users	Consumers, municipalities and all industries
Resource recovery	Selling materials recovered and converted from industrial by-products or post-consumer waste	Municipalities Generating industries Solid waste companies
Clean energy Sources	Selling power and systems in solar, wind, geothermal, small- scale hydro, energy efficiency and DSM	Utilities All industries and consumers

Source: Environmental Business International Inc. (San Diego, California).

3. Size of the Global Environmental Industry

The global environmental market reached an estimated US$ 522 billion in 2000 (table 2). Although 85 per cent of this market was in

the United States, Western Europe and Japan, these areas have collectively represented only 2-3 per cent annual growth in recent years. In developed nations environmental markets are in a period of transition where market drivers relying on regulations and enforcement have diminished in effectiveness as regards their ability to secure further environmental improvement. New policies emphasizing market instruments, economic policy, information disclosure, voluntary business standards and other measures are slowly being tested as nations seek to achieve more gains in environmental quality, basing policy on sustainability issues rather than regulatory compliance.

Table 2. Size of the global environmental industry by region

	US$ Billion in 2000	
United States	197.7	38%
Western Europe	156.0	30%
Japan	90.7	17%
Rest of Asia	24.6	5%
Mexico	2.3	0.4%
Rest of Latin America	9.4	2%
Canada	13.6	3%
Australia/New Zealand	8.5	2%
Central and Eastern Europe	9.4	2%
Middle East	6.6	1%
Africa	3.4	1%
	522	

In the developing world, the situation is quite different. Most nations lack the basic environmental infrastructure to provide drinking water, wastewater treatment and solid waste management, as well as making little progress in limiting or controlling industrial air pollution, water pollution and hazardous waste generation. These markets exhibit a tremendous need for environmental equipment and services, but in spite of legal structures that are adequate, the political and

economic situation rarely leads to a healthy and consistent environmental market. Nonetheless, strong growth is forecast in transition economy markets and subsequently in developing markets as domestic policy and overseas development assistance programmes combine to create a market out of the tremendous need of those markets.

Ready to respond to the challenge, the world's environmental industry represents one of the largest accumulations of technical, engineering, manufacturing and management skills in the world today. Prospects for growth in demand for these talents, however, do not look as promising as they once did. Initial perceptions that environmental problems in the developing world and transition economies would sustain strong growth are not unfounded. However, many of these nations have been slow to develop functional enforcement mechanisms for their already substantial environmental laws and regulations, and funding for environmental projects in the private and public sectors has often been difficult, this difficulty being exacerbated particularly by regional financial and economic crises.

In the developed world, another factor is in play. Here substantial environmental work has been done and substantial environmental industries have evolved in response to a more cohesive environmental policy. The demand created, however, by the predominantly punitive regulatory systems has levelled off as the major industries which represent the most obvious targets of enforcement activities have reached acceptable measures of compliance. There is little doubt that in advanced environmental economies such as the United States and Germany, the domestic market for equipment and services related to pollution control, compliance and clean-up or remediation has declined in recent years. While these functions represent only 27 per cent of the environmental market in markets such as that in the United States (see below), their decline has driven environmental service companies to seek growth opportunities in the developing world.

By far the largest part of the environmental industry, and an even greater part of its service segments, are represented by designing, building, operating and maintaining environmental infrastructure and

resource systems mostly related to water, wastewater, solid waste and resource recovery (table 3). It is these segments that not only are currently burgeoning in the developing world in terms of demand, but also are the largest sustainable growth areas for environmental service companies in the developed world.

With recovery and stability on the way in Latin America and South-East Asia, broadening demand in the Middle East, Eastern Europe and even parts of Africa, and the emergence of China on the global economic scene, the environmental market outside the developed world looked better in 2000 than it had for a number of years. At the same time, economic prosperity in the United States and strengthening economies in Europe and Japan were creating a generally positive business climate.

The environmental industry itself has globalized to take advantage of these opportunities, but little leadership has been provided by United States companies. In the prominent water, wastewater and solid waste segments—which together represent more than half the global market—the United States environmental industry has lost ground through the outright acquisition of its leading companies (the French firm Vivendi's purchase of U.S. Filter in the water segment) or the divestiture of international assets (sales of foreign operations by BFI and Waste Management in the solid waste segment).

Control of the water and solid waste service segments invariably has an effect on equipment and supply sales, and if the two equipment segments that supply the waste and water infrastructure are added to the service totals, this represents more than two thirds of the global market where the United States environmental industry is losing competitiveness. That industry remains fairly well positioned for the remaining third of the market, however, and has by no means given up on the water and waste segments, but must leverage its comparative advantage in consulting and engineering, remediation, instruments and information technology and services. Opportunities in automation for treatment systems and monitoring, advanced design, biological systems, materials reuse and efficiency, and use of the Internet are all

areas in which United States companies should be in a good position to gain market share.

Table 3. Size of the global environmental industry by segment

Equipment	US$ Billion in 2000	
Water equipment and chemicals	45.1	8.6%
Air pollution control	32.9	6.3%
Instruments & info systems	7.1	1.4%
Waste Mgmt equipment	34.3	6.6%
Process and prevention tech	2.8	0.5%
Services		
Solid waste management	112.7	21.6%
Hazardous waste management	17.1	3.3%
Consulting and engineering	29.2	5.6%
Remediation/Industrial services	27.3	5.2%
Analytical services	3.1	0.6%
Water treatment works	74.1	14.2%
Resources		
Water utilities	81.2	15.6%
Resource recovery	42.2	8.1%
Environmental energy	12.5	2.4%
	522	

4. Global Market Numbers by Segment

As mentioned above, the global environmental industry reached an estimated US$ 522 billion in annual revenues in 2000, according to data compiled and analysed from more than 50 sources by Environmental Business International Inc. Overall growth in 2000 was about 4 per cent, up from 1998 and 1999 growth rates of 2-3 per cent. It is hard, however, to look at the environmental market, or the world

for that matter, as a cohesive unit. Within the environmental industry, variation between segments is considerable, and globally the variation between developed, developing and transition economies—and particularly their environmental markets—is understandably great.

Among industry segments, recent growth has been led more by equipment segments than by their service or resource counterparts. Service markets are in relative decline for a number of reasons relating to fundamental transitions in the industry. Projects and initiatives have shifted from assessment to solutions, from pollution control to pollution prevention, and less waste is generated per unit of output in most major industries. These trends are particularly true in developed nations, although the pace of improvement has slowed recently. In general, customers have become less reliant on service providers to identify and solve all their environmental problems and have moved on to maintaining their own solution system—or obviating the need for any environmental solution at all by a change in process, material or product line.

In developing nations and transition economies, enforcement mechanisms remain inadequate to drive environmental markets to the level they are at in developed nations. Also, a considerable portion of their industrial communities are represented by global multinationals, many of which have adhered to domestic standards and are pursuing longer-term environmental strategies of prevention over control. In other words, the continued globalization of business and liberalization of trade should serve to enhance environmental conditions in the developing world.

A separate factor driving equipment sales more than services is the substantial migration of environmental equipment vendors outside their borders in the past decade. While United States equipment segments make up only 26 per cent of the industry, they account for 58 per cent of exports. Conversely, while service segments account for more than 50 per cent of industry revenues, they represent only 19 per cent of exports (see table 4).

Table 4. 2000 United States environmental industry trade balance

Equipment	US ind	US mkt	Surplus	Exports	Imports	% export
Water equipment & chemicals	19.8	16.7	3.1	5.83	2.7	29%
Air pollution control	17.6	16.1	1.5	3.70	2.2	21%
Instruments & info. systems	3.6	2.5	1.2	1.49	0.3	41%
Waste management equipment	9.9	9.5	0.3	1.77	1.4	18%
Process & prevention technology	1.2	1.3	-0.1	0.07	0.2	6%
Services						
Solid waste management	39.0	39.4	-0.4	0.70	1.1	2%
Hazardous waste management	5.1	5.2	-0.1	0.05	0.2	1%
Consulting & engineering	17.4	15.7	1.7	2.44	0.7	14%
Remediation/industrial services	11.2	11.1	0.1	0.40	0.3	4%
Analytical services	1.2	1.2	0.1	0.06	0.0	5%
Water treatment works	28.4	30.8	-2.4	0.20	2.6	0.7%
Resources						
Water utilities	30.3	32.6	-2.3	0.09	2.4	0.3%
Resource recovery	16.0	13.1	3.0	3.37	0.4	21%
Environmental energy	4.2	2.6	1.6	2.27	0.7	54%
Total	**204.9**	**197.7**	**7.2**	**22.4**	**15.2**	**10.9%**

Source: EBI Inc., San Diego CA, units in $ bil. US ind is revenues generated by US cos worldwide. US mkt is revenues from US customers. Exports do not include ownership of overseas companies but do include repatriated profits.

The globalization of environmental equipment markets has occurred faster than that of services mostly because of the inherent nature of the product—it is easier to export a manufactured product than a consulting project, for instance—and this trend looks likely to persist as environmental export activities in the leading economies gather momentum. It is no secret that Germany, the Netherlands, Denmark and other countries have made a concerted effort to do their best in global markets. “We solved all our problems at home some

time ago", said an executive from a German consulting company at a United Nations meeting in Manila. “That’s why we are all here.”[1]

5. Global Top 50 Companies Reflect National Strengths

As the industry changes, so do its leading players. EBJ’s fifth compilation of the world’s top environmental companies, carried out in 1998 and presented below (table 5), demonstrates how the characteristics of a domestic market can decide which type of environmental company will become dominant. In France, private management of the water and wastewater infrastructure has resulted in its having two of the three largest environmental companies in the world. These two, Vivendi and Suez Lyonnaise des Eaux, have leveraged their considerable capital bases into other segments within the industry with business synergies such as water equipment and chemicals and customer synergies such as municipal solid waste, as well as into many other sectors such as power, telecommunications and real estate. Vivendi’s United States presence includes not only U.S. Filter but also the US$ 400-million Superior Services in solid waste, a deal with the old Chemical Waste Management facilities held by Waste Management in hazardous waste and numerous companies in water equipment and water-related instrumentation. Lyonnaise’s prominent United States holdings include United Water Resources, the second largest private water utility and contract operations firm, and Nalco Chemical, the top water chemical company. In the developing world, both these French giants have established partnerships and investments in water systems in Asia, Africa, Latin America and elsewhere.

Like the French firms, the United Kingdom’s top firms resulted from the privatization of water and wastewater utilities, although this was done in a sweeping gesture in 1989. The United Kingdom has 9 of the top 60 environmental firms in the world, all of which started as water utilities but some of which have diversified into other segments. Germany’s water infrastructure remains for the most part in public

[1] UN-DPSCD, Third Expert Group Meeting on Financial Issues of Agenda 21, 6-8 February 1996, at ADB in Manila.

hands, as in the United States and Japan, and its top environmental firms tend to be in engineering construction (EC) and solid waste. Japan's leading firms are technology- and equipment-oriented or are part of larger conglomerates. Top United States firms are in the more broadly privatized and consolidated solid waste sector, but also include global leaders in EC and consulting and engineering (C&E) and some supply segments, notably instruments.

The global industry continues to consolidate, although not quite so rapidly as other sectors. EBJ's global top 50 in 1994 accounted for 17.5 per cent of global revenues, subsequently moving up to 18.6 per cent in 1995 and reaching 20.6 per cent, or almost US$ 100 billion in 1998.

Table 5. Top 50 global environmental companies in 1998
(Latest year full list is available)

98 RANK	COMPANY	COUNTRY	SEGMENT	98 ENV'L REVENUES US$ MILLIONS
1	Vivendi (Générale des Eaux)	France	Water/SW/HW/WE&C	13 192
2	Waste Management	USA	Solid waste/WME	12 704
3	Suez Lyonnaise des Eaux	France	Water/WE&C/SW	7 254
4	Browning Ferris Industries	USA	Solid Waste	4 746
5	Severn Trent	UK	Water/WW/C&E	3 756
6	SITA (Lyonnaise)	France	Sol/haz. waste	3 152
7	Mitsubishi Heavy Industries	Japan	Incin/APC/water equip.	2 605
8	Ebara Corp	Japan	W/WW/APC/SW/RIS	2 566
9	Bechtel Group Inc.	USA	EC/remed.	2 504
10	Kubota (Ind'l Eq div.)	Japan	Equip.	2 204
11	Thames Water	UK	WU/WTW	2 135
12	Rethmann Entsorgungs	Germany	Solid waste	2 032
13	Betz Laboratories Inc.	USA	Water treatment	1 900
14	Republic Services	USA	Solid waste	1 839
15	Allied Waste	USA	Solid waste	1 576
16	RWE Entsorgung AG	Germany	Solid waste/C&E	1 511
17	Noell Gmbh	Germany	APC/EC/SW/RR	1 500
18	Bilfinger + Berger	Germany	EC	1 432
19	Hitachi Zosen	Japan	WME	1 345
20	Anglian Water	UK	Water	1 336
21	Nalco Chemicals Co.	USA	Water equip./chemicals	1 293
22	United Utilities	UK	Water/WW/equip	1 283
23	Kurita Water Industries	Japan	Equipment	1 236
24	Philip Services	Canada	RR/ind'l svcs	1 200
25	Safety Kleen Corp.	USA	Haz. waste/recycling	1 185
26	Asea Brown Boveri Corp.	Switzerland	APC/WME	1 130
27	Kelda Group (Yorkshire)	UK	WU/WTW/AS/med.waste	1 083
28	IT Corp.	USA	C&E/remed.	1 052

98 RANK	COMPANY	COUNTRY	SEGMENT	98 ENV'L REVENUES US$ MILLIONS
29	American Water Works Co.	USA	WU/WTW	1 018
30	CH2M Hill Cos.	USA	C&E	1 017
31	Fomento de Construcciones y Contratas	Spain	EC/wolid waste	1 000
32	Philipp Holzmann	Germany	Solid Waste/EC	988
33	Takuma (Envl Eq & M/M divs)	Japan	Equip.	983
34	Babcock Borsig (Deutsche Babcock)	Germany	WME/APC	981
35	Hochtief	Germany	EC	921
36	Northumbrian Water	UK	W/WW	908
37	Thermo Electron Corp.	USA	Inst./C&E	850
38	Fluor Daniel Inc.	USA	EC	833
39	Foster Wheeler Corp.	USA	EC	753
40	Southern Water	UK	WEC/WU	751
41	Black & Veatch	USA	C&E/EC	749
42	Linde	Germany	Equip/C&E	726
43	California Energy	USA	Geothermal Power	700
44	ICF Kaiser International Inc.	USA	C&E	670
45	Organo	Japan	Water equip.	666
46	Tsukishma Kikai	Japan	Water/sludge/incin. eq.	639
47	Buderus	Germany	Construction/WEC	602
48	GEA Pref.	Germany	EC	584
49	NEG Micon	Denmark	Wind power systems	580
50	Edelhoff AG&Co	Germany	Solid waste	528
51	Vestas	Denmark	Wind power systems	522
52	Earth Tech	USA	C&E	502
53	Watco SA	Belgium	Solid waste	500

Source: Environmental Business International Inc. (San Diego, CA). Figures are revenues generated for calendar year 1998 in the environmental industry only. This list is a result of data compiled from public sources and independent research conducted by EBI. In some cases, revenues are

approximations derived from executives, analysts and reputable business information sources. Although EBI has made every reasonable effort to be accurate, figures are not the result of internal or external audits and are therefore not guaranteed to be accurate. Errors and omissions are unintentional.

6. Changing Environmental Market Drivers

Over the next 20 years, the world's economy will undergo an important and inevitable shift that will fundamentally change the way in which our environment and our resources are valued and managed. Economic – not environmental – policy will create a larger and enduring framework for sustainable development. The true manifestation of sustainable development lies in the internalization of what economists have historically classified as "externalities": pollution, waste accumulation, contamination and natural resource degradation. In a truly sustainable economy these externalities will be internal to the free market economy and part of the financial equation for all private enterprise and government operations, thus creating an ongoing economic incentive for continuous environmental improvement that is sadly lacking in environmental markets today.

With declining effectiveness of regulation, environmental technology development is increasingly being driven by resource economics rather than by environmental regulation. The international competitiveness of nations will increasingly depend on the appropriate application of environmental technology. Pollution and waste generation are starting to be seen not as just a threat to the environment and public health but as manifestations of inefficient resource use from an economic perspective. In a more sustainable economy, the world's leading economic nations will have the most efficient industries in terms of energy, resources and materials use, and at the same time offer their citizens the highest quality of life – measured not only by economic standards but also by public health and environmental quality.

THE ENVIRONMENTAL INDUSTRY AND PROSPECTS FOR BUILDING CAPACITY IN DEVELOPING NATIONS

The environmental industry on its own cannot usher in the eternity of global sustainable development. Nor can it be solely responsible for creating the framework for demonstrating competitive advantage through environmental quality. But the relative success of the environmental industry in its ability to adjust to delivering on competitive and sustainability goals rather than environmental compliance issues will be instrumental to the competitiveness of all industries in a sustainable economy.

The environmental industry itself is only gradually becoming aware of this aspect of its future, after years of preoccupation with short-term compliance issues. In the long term the environmental industry will be more along the lines of efficient resource management taking the forms of:

- Water resource management, water delivery, wastewater treatment and water reuse and recycling systems;
- Privatization of what traditionally have been municipal environmental services, such as provision of water, wastewater treatment and waste management;
- Transitioning waste management into resource management through resource recovery and recycling systems, as well as designing reusability and recyclability into all products;
- Energy efficiency and more sustainable energy systems from renewable sources;
- Industrial design for pollution prevention and efficiency in the form of life-cycle analysis and design for the environment; and
- Application of analytical and information technology for pollution prevention, process efficiency and operations.

Several European companies provide useful examples of how international business competitiveness was improved as a result of privatization of water utilities and wastewater treatment works. France and the United Kingdom have become by far the most internationally

competitive for providing the integrated package of designing, building, managing and even owning water infrastructure around the world. It is no coincidence that French and British companies have won the major projects in Mexico, Brazil, Malaysia, Taiwan Province of China and elsewhere.

Privatization of the solid waste infrastructure in the United States has effectively made the United States demonstrably the most internationally competitive in this segment. The importance of the three environmental infrastructure segments (solid waste management, resource recovery, water treatment works and water utilities) cannot be overemphasized, because together they represent 60 per cent of the US$ 522-billion global environmental market, and in the developing world almost 70 per cent.

German government statistics indicate that annual investment in environmental protection by Germany's manufacturing sector decreased from a peak of US$ 4.6 billion in 1990 to US$ 2.9 billion in 1995 and has continued to slide ever since. In spite of the fall-off in the domestic market, Germany’s Ministry for Environment states that its environmental industry grew throughout the 1990s, fuelled principally by exports. It maintains that in 1995, Germany was the world leader with 19 per cent of what it called the “export” market (i.e. markets outside Germany but not counting other nations' domestic sales), followed by the United States (18 per cent) and Japan (15 per cent).

Table 6. Relative competitiveness of environmental industries by nation/region

Equipment	USA	Germany	Japan	F & UK	Dev'g	Weight
Water equipment & Chemicals	G	G	GE	**GE**	MP	3
Air pollution control	OG	**E**	**E**	O	MP	3
Instruments & info Systems	**E**	G	G	O	P	3
Waste management Equipment	G	**GE**	OG	O	OM	2
Process & prevention tech.	P	P	**M**	P	P	1
Services						
Solid waste management	G	OG	OM	**EG**	MP	3
Hazardous waste management	**G**	O	O	OG	P	2
Consulting & Engineering	**GE**	OG	M	OG	MP	3
Remediation / Industrial Services	**G**	O	M	OM	P	2
Analytical services	**G**	O	O	O	MP	1
Water treatment Works	MP	M	MP	**GE**	MP	4
Resources						
Water utilities	MP	MP	P	**GE**	MP	3
Resource recovery	O	**OG**	O	O	MP	1
Environmental Energy	**OG**	**OG**	**OG**	**OG**	P	2
Rating	111	105	93	111	47	

Source: Environmental Business International, Inc., San Diego, E-excellent, G-good, O-OK, M-mediocre, P-poor. Based on ratings of technology, commercial orientation, management, finance, global presence, government support and labour.

EBI estimates that while Germany's 20-25 per cent of environmental industry revenues generated from outside its borders compares favourably with the 10 per cent for the United States in 1998, Germany's overall export dollars of a little over US$ 9 billion are less than half the US$ 18.9 billion figure for the United States. Lack of uniform segment definitions plague environmental market and export comparisons of government and private data, although this should improve significantly provided that nations remain close to classifications and methodologies agreed upon in a series of OECD-sponsored meetings from 1997 to 1999.

Japan exported 15-20 per cent of its US$ 88-billion environmental industry in 1998 for around US$ 15 billion in international revenues. It has made a concerted effort to promote exports like the others, but also to promote imports to enhance its own environmental industry capacity and manufacturing efficiency. The definition of the environmental market in Japan used by the Ministry of International Trade and Industry (MITI) includes many of the segments used by EBI and in the OECD manual but adds "environmentally safe manufacturing upgrades" (US$ 1.8 billion in 1997) and "new energy and conservation" (US$ 14.8 billion). MITI lists the following areas as markets with immediate potential in Japan: waste reduction, dioxin treatment and analysis, consulting engineering and environment assessment, toxic waste management, plastic recycling equipment, wind power and technology for cleaner vehicles. The worst of Japan's economic decline in the late 1990s, which also impacted on the environmental business, has been left behind and MITI forecasts annual growth in the double digits, paced by both slightly better economic conditions and the many areas of "catch-up" that Japan must still pursue in environmental programmes. Seasoned environmental market observers are less optimistic but still acknowledge that growth could exceed that of the overall Japanese economy for some time, led by remediation, recycling and energy and industrial process efficiency investments stimulated by waste avoidance programmes started as industrial waste disposal costs increase.

7. Market and Policy Evolution Scenarios: Leadership up for Grabs in Resource Productivity

A last frontier for the environmental industry, especially in the light of global policies related to climate change—not to mention the rising price of oil—is the environmental energy or "clean energy" segment. This business segment continues to evolve and includes renewable energy technology and systems, small-scale off-the-grid applications such as microturbines and fuel cells, as well as efficiency technology in power generation, storage and transmission, and an array of high-efficiency energy-consuming devices.

No nation or region has a clear advantage in renewable energy or energy efficiency, although markets increasingly value these types of technologies with the addition of climate change policies, various energy independence policies and, sporadically in bursts, when oil prices are up. Many observers assert that competitiveness in resource productivity related to energy (as well as materials, water and even human resources and information) will be the foundation of industrial and national competitiveness in the future—even more so than information technology and the Internet.

Although we are at the beginning of an Internet era that can revolutionize the way we do business, the Internet revolution may not have the lasting impact of the coming energy revolution. It seems unlikely, however, that equity markets in the short term will give equal recognition to the promise of resource productivity and non-fossil fuel energy sources as they once did to Internet stocks.

Nevertheless, long-term strategists in many United States industries, such as power utilities (Duke Power, PG&E, Florida Power & Light), manufacturing, consumer goods and even multinationals based in traditional fossil fuels (BP/Amoco) have structured investment plans around more sustainable resource economics. As the economics of resource productivity take hold across all industries and around the world over the next two decades, the definition of environmental technology, the environmental industry and especially

what are now viewed as environmental companies will continue to change.

The process of environmental industry evolution has occurred principally in the developed world, and most notably in the United States and Europe. Even in the developing world, many nations have based their environmental standards, programmes and regulations on those already set up in other nations. For instance, the regulatory systems in Canada and Mexico, though unique in their own way, are very much based on the United States' laws and system. In Europe with EU standards becoming more influential, many policies and programmes are "borrowed" from nations which have led the way and through successes and failures have settled on systems that work for them.

Uniformity in environmental policy is a good thing for society and a good thing for the global environmental industry. No one wants a situation where companies can "go elsewhere" so that they can continue to pollute or brazenly exploit resources with impunity. Similarly, companies selling environmental solutions in services and equipment desire some uniformity in demand drivers so that they are not "reinventing the wheel" every time the same problem arises in a different nation. Of course, national sovereignty must always be respected.

The dilemma of the need for both uniformity in environmental policy and some degree of national sovereignty is a crucial issue for the world, and especially the developing world. Examples abound of developing and transition nations overexploiting their resources or "under-regulating" the environment in exchange for short-term economic gain. In March 2002 international controversy brewed as the Brazilian Government proposed to open up significant portions of its undeveloped land to investors with some of the worst track records for "unsustainable" development. At the same time in the United States, the Bush Administration continues openly to admit to, and be subjected to pressure for, relaxation of environmental standards, as a result of which a number of high-level officials of the Environmental Protection Agency have resigned.

Clearly, there is no easy solution to the environment versus economy debate, and it is also clear that this debate will persist in the developed and the developing world in perpetuity. Some policy leaders envision a system based much more on economics and taxation that will "level the playing field" for all nations in terms of pollution and resource use. However, if these economic measures curtail the development aspirations of the developing world and their desire to substantially raise the standard of living for their populations, they will have to be applied carefully.

Perhaps a system of environmental taxes or pollution fees, or unsustainable resource extraction fees, could be retroactively applied, one based on the negative economic impact created by almost a century of unsustainable activity in the developed world. In other words, the United States or Japan has consumed a certain measure of fossil fuels since what is called the Industrial Revolution, and a certain increment in fee or tax could be applied for each unit. The fees raised by such an exercise could be used by developing nations to develop their infrastructure for power, materials, waste, water and other resources using the best technology rather than the cheapest technology – and even drive demand for environmental technology innovation and global environmental technology transfer on a scale certainly not seen today.

Admittedly, solving the world environmental and economic problems is not within the scope of this paper, but in its full extension the issue of capacity development of environmental services in developing nations comes back to the central issue of the future of environmental and economic policy.

8. Review of Markets in Developing Regions

While the objective of uniform environmental policy and markets remains, the reality is that each nation’s environmental market evolves in its own way, affected by social, economic and political issues inside its borders, as well as by some pressure from outside its borders. The following review is included not necessarily to serve as a model or to set examples for markets, but more to capture some fairly recent

trends in environmental markets in selected nations. Much of the research was conducted over a two-year period and some situations may have changed, but again this information is included more for the purpose of illustration rather than to serve as comprehensive analysis.

8.1 Asia's Markets into Recovery

For global markets on a geographical scale, while growth rates may be considerably lower in developed nations, the net gain in additional revenue remains substantially larger because of their larger size. The United States, Western Europe and Japan may all be considered mature markets with little chance of growth higher than 3-4 per cent except in a few niches, but they still represent 85 per cent of the global market—and 72 per cent of the revenue gain from 1999 to 2000, even with Japan's decline in the year 2000. Prior to the late 1990s, however, a larger portion of revenues in global environmental markets was added in transition economies subsequently derailed by regional financial crises in Asia and Latin America.

Emerging environmental markets in South-East Asia, which grew by 15-25 per cent per annum in 1995 and 1996, slowed to a halt and in some cases declined in 1997 and 1998. This turnaround only reinforced the lesson learned in the United States market in 1991 and 1992, namely that environmental markets were certainly not immune from economic down cycles but were in fact vulnerable to them. Adding insult to injury, analysts often contend that environmental markets are quick to fall in down times but are slow to turn around when an economy heats up again.

The outlook for environmental markets in Asia by 2000 looked more promising than in the previous three years, as recovery has come a little sooner than many observers expected. Once the scene of surging economies, South-East Asia is still feeling some effects of its worst financial crisis in decades. Thailand, the epicentre of the financial meltdown in the region starting in 1997, was slow to shake off recession. The Republic of Korea and Indonesia, also among the hardest hit, have taken the bitter pills of economic retrenchment, as

government planners undertook painful austerity measures with drastic cuts in budgetary spending and infrastructure projects.

In spite of the turmoil, many believe that environmental markets are emerging even stronger than before. Asia's highly degraded environmental conditions should be viewed as a long-term business opportunity, in the absence of strong regulatory drivers and enforcement resources. Many Asian countries have a comprehensive set of regulations already in place, and they are being enforced with time-bound targets.

According to Environmental Business International's analysis of Asia's environmental markets, the cash crunch forced decision makers to restructure priorities with the focus on essential infrastructure, such as energy, water supply and sanitation, and waste management. With external assistance, public sector agencies have long-range multi million dollar spending programmes and are encouraging private-sector investments. Multinationals are still pursuing their own internal environmental compliance agendas, and Asia's global exporters are compelled to address ISO requirements.

EBI defines Asia's markets in tiers, taking into account annual GDP growth, environmental imports and investments as a percentage of GDP, evolution of environmental market drivers and barriers, and environmental industry competition. In the first tier is Japan, the world's second largest environmental industry after the United States and a market approaching maturity in many sectors. In the second tier are the newly industrialized economies of Hong Kong (still treated as a unique region of China), the Republic of Korea, Singapore, and Taiwan Province of China. These economies have moved to a slower pace and, in general, the rate of environmental investments is expected to wind down within the next few years.

The third and fourth tiers are where growth will be fastest in the long term. In South-East Asia, China and India opportunities remain in virtually all environmental sectors, although companies have to become increasingly selective over time. In early-stage markets, the public sector is often the instigator as well as the largest customer for

environmental equipment and services. In many ways, however, Malaysia's visionary nationwide approach to heavy private sector participation in its infrastructure is showing how the onus is shifting to the private-sector. But it also demonstrates that Governments must take the initiative in addressing environmental issues if countries are to recapture economic momentum. The time-honoured balance between an all-out attack on environmental problems and maintaining maximal conditions for economic growth in key export sectors is rarely a battle won by the environmentalists, however. The choice of an increment of recovery over an increment of improvement in environmental quality will work to keep opportunities of high commercial value in the most essential areas, such as drinking water, immediate health concerns and clean-up of properties.

8.2 European Regional Overview

It has been an interesting time for Europe. The advent of the euro economy and the forthcoming EU expansion into Eastern bloc countries are historic ventures. It is forecast that Europe's integration will provide the trigger for the economic revitalization of the continent. In spite of financial distress in the Russian Federation and Asia, high unemployment, high taxes and reactions to welfare reform, many remain optimistic that a rising tide in Europe can lift all boats. Proponents of fuller integration also argue that the single currency will lift European business competitiveness.

In the past couple of years there has been renewed attention to the historically lacklustre European economy, but little has translated into positive signs in terms of numbers. One of the main driving forces behind environmental protection in Europe is pressure from the European Commission. In response to mounting scrutiny from the Commission, the pace of national environmental initiatives is quickening and government and private spending on environmental protection has been rising steadily. While important strides have been made in implementing environmental legislation, enforcement remains a key challenge in 2002. But the European Commission is determined to police environmental pledges, and it has shown on a

limited scale that it will resort to infringement proceedings against Member States for non-compliance.

8.3 Central and Eastern Europe

After years of economic contraction, Central and Eastern Europe (CEE) has been experiencing a modest economic turnaround since the mid-1990s. Thanks to structural reforms and stabilization policies, the region boasts a growing private sector, which now accounts for at least half of economic production. Economic growth estimates for the region are in the 3 per cent range.

Vying for membership in the EU, several CEE countries have made initial steps in developing the economic and domestic structures necessary for meeting EU standards. Many of the CEE countries, such as the Czech Republic, Slovenia and Bulgaria, have already laid the general groundwork for environmental legislation, including the adoption of basic principles such as the requirements for polluters to pay, focus on prevention and precautionary measures. However, the regulations are underdeveloped, enforcement remains spotty and the responsible authorities are understaffed. Investors perceive the CEE environmental industry as small and risky. As a result of weak financial markets, problems in accessing credit and finance have perpetuated this view, according to an OECD report.

The CEE's environment industry is primarily composed of young and small to medium-sized firms. According to the results of the survey by the OECD/REC, the industry is about "equally distributed" between manufacturing and services. On average, 30 per cent of companies are involved in water and wastewater, 23 per cent in solid waste management and 21 per cent in air pollution control. This is mainly due to the fact that the main environmental legislation in the region has focused on water, waste and air. Only 8 per cent of companies has provided any equipment and services for remediation, although this is a big issue in the region. Many firms were quite diversified, offering services and products in more than one segment.

Communist-era coal mines, steel mills and chemical plants have left behind massive environmental degradation in Poland. As much as 25 per cent of Poland's industrial discharge into surface waters is still released untreated and only one third of its sewage that flows into the Baltic is treated. For EU membership, Poland will be bound by EU economic and environmental policy. Consequently, environmental protection measures will continue to move at a brisk pace. Environmental expenditures rose from US$ 580 million in 1990 to US$ 1.6 billion in 1996, according to the US & Foreign Commercial Services and the pace has not slowed too much since. In 1999, the Polish Government put forward a 15 billion zloty ($4.35 billion) programme to overhaul the budget-draining (and highly polluting) mining industry. The World Bank estimates that the total cost of complying with existing EU standards in Poland will be $35-$50 billion.

Over 3 per cent of the Czech Republic's GNP is now said to be dedicated to pollution control efforts. The cost of clean-up for the Czech Republic to meet the pollution levels of OECD countries by 2015-2020 is estimated at least $15 billion.

Implementation of Hungary's National Environmental Action Plan, adopted in 1997, is estimated to cost $4 billion. However, as is common in the region, Hungary lacks consistent enforcement. Of the total environmental expenditures in Hungary, 55 per cent is spent on water protection, 16 per cent on air protection and 12 per cent on waste management.

8.4 Latin America's Recovery Is Welcome News for Environmental Companies

Latin America's economic performance in 1999 was far short of projections—from GDP projections of 2.3 per cent growth, final numbers showed that region-wide performance was negative in 1999. The Russian default of August 1998 had a lingering effect into 1999—and was the cause of Brazil's devaluation. Capital flight from the region also exacerbated the situation. The year 2000 was no quite so

bad, but 2001 was hit by the shocking meltdown in Argentina and resulting reverberations which affected the region.

Two facts, however, suggest a reason for some optimism in 2002. First, Brazil—the largest economy and the hardest hit in 1999—has managed some economic recovery since 1999, as well as some growth in its environmental sector. Second, the price of oil has helped a number of economies in a very substantial way—Venezuela, Colombia and especially Mexico are in far better shape today with US$ 20/barrel oil than they would have been with US$ 10/barrel oil. Indeed, Mexico's economic performance is so robust that there is significant reason to believe that it has "decoupled" from the rest of Latin America, and will grow in the 4-5 per cent range in the coming years. There is even talk of Mexico gaining an investment grade credit rating after the results of the June 2000 presidential elections and the fall of the long-ruling party showed the political transparency that lenders like.

From an environmental perspective the economic downturn had a significantly negative impact on projects in the region. At the most basic level, countries focused on exports as the engine of growth, and were not willing to enforce burdensome environmental regulations on industrial producers. In this context, there is little driving the critical issues of regulation and especially enforcement.

Overall economic expectations in Latin America are for positive growth during 2002 of an estimated 2-3 per cent. Latin American growth should be stable, non-inflationary and led by the private sector, all good signs for the environmental sector. The region continues to be a strong importer of products from industrialized countries and remains committed to open market policies' economic pressures. Imports of environmental goods and services continue to comprise an important share of overall demand. Latin America will slowly increase investments in environmental infrastructure as investor confidence returns to the region, and as economic performance improves around the world—thus creating new and better-paying markets for Latin American export commodities.

Regional policy makers, following world trends, are positioning the private sector as a dominant investor in the creation of new environmental infrastructure. This has created a market for concessions and is providing substantial opportunities for firms with operations expertise. Many of these private sector schemes, however, have fallen short of their objectives as the long-term risks obstruct easy financial solution. The region is struggling to create a superior financial model that will allow for far greater investment and hence demand for environmental services and equipment.

On the public sector side, the World Bank and the Inter-American Development Bank continue to be very important players in Latin America's environmental sector. Bi-lateral agencies and particularly Japan's Overseas Economic Cooperation Fund are another important source of environmental investment. The spending programmes of these institutions should be closely monitored, as they are a major driver of environmental business opportunities, and important contributors to precedents for how projects are developed, financed and operated by private and public entities.

Water and wastewater consistently present the largest market segment for environmental companies in Latin America. Opportunities will increasingly centre on the roughly 550 "mid-market" municipal projects, and on niche industrial wastewater projects. Privatization activity will begin in Brazil, and will continue in Colombia and Mexico. Although potable water coverage rates are relatively high in urban areas, rural areas are often badly underserved. At the same time, growing populations in urban centres demand new water supply projects. Most potable water projects are publicly financed, with additional funds coming from the multilaterals and increasingly from Japanese funding. Wastewater treatment coverage levels in Latin America are extremely low and, although the market is immense, investment dollars for this sector have been scarce. Private sector participation in the sector has not materialized, requiring countries to rethink financing strategies and their political approach to privatization. As in the case of potable water, multilateral and bilateral

lending is the driver behind many major projects such as those in Lima, southern Brazil and Mexico City.

J. Paul Oxer, vice president, international development, at Azurix Corp. (Houston, Texas), believes that privatizations will occur in almost all of Brazil's 27 States in the next three years. He says that, overall in Latin America, more than US$ 40 billion of investment is required in collection and treatment infrastructure, and the private sector seems the most logical source for this capital. In Brazil, arguably one of the more advanced nations, still only 40 per cent of wastewater is collected and only 10 per cent of that is treated. In Chile only 3 per cent of wastewater is treated. There is much to gain in system efficiency as well. Most areas have a leakage or technical loss rate of at least 50 per cent (the United States average is 15 per cent). In addition, in the average Brazilian utility, said Oxer, there is an average of seven employees per thousand water connections, compared with 2.2 employees in United States water utilities, themselves not known as paragons of efficiency. Water and wastewater projects undoubtedly yield the most significant business opportunities in Latin America—both for privatization and contract operations of facilities, and for subsequent technology and systems investments in the public and private sector.

According to CG/LA Infrastructure (Washington, DC), among the notable areas of opportunity are:

- The reactivation of Brazil's public water sector investment programmes, and the attempt by BNDES to create a privatization model for the water sector;
- Chile's successful privatization of State water companies, which is driving complementary investments in system improvements;
- Secondary markets, or mid-tier cities, in Mexico and Argentina, where locals have begun to recognize their lack of technical and investment firepower. (Mexico's major projects in Mexico City, Guadalajara and Baja California have been stalled for political

and financing reasons, and Buenos Aires has already been privatized.);

- Spending along the United States/Mexican border;
- Lima's wastewater investment programme financed by the World Bank;
- Several large "clean-up" projects in Brazil financed via World Bank loans;
- Colombia's privatization of its municipal water authorities, led by the successful privatization of Monteria announced in November 1999.

Prominent transactions in Latin America in 1999 and 2000 included:

- The Agosba concession won by Azurix in Argentina in May 1999. The $440-million purchase set a level of expectation and primed the pump for many other of Latin America's water concessions;
- The privatization of Chile's State-owned water companies, including EMOS (near Santiago) to a consortium led by Aguas de Barcelona and Suez Lyonnaise des Eaux, which requires a $175-million investment in the Santiago Sur wastewater treatment facility in the first phase, ESVAL (near Valparaiso) to a consortium led by Chilean electricity company Enersis and the UK's Anglian Water International. At least two other cities are undergoing serious negotiations to privatize their water companies:
- The privatization of Monteria in Colombia won by FCC, which is expected to set a model for 16 projects to follow, with a $35-million concession in San Andres and a $45-million concession in Ibague expected to be awarded in the first half of 2000.

Waste. Municipal and commercial solid waste generated in Latin America is not disposed of according to United States standards, and open landfills are the most common disposal method. A number of countries have attempted to concession new state-of-the-art landfills to the private sector, but have had very limited success to date. The solid waste disposal market is not expected to show much growth in 2002-2005. Many Latin American cities offer concessions to the private sector for the collection of municipal solid waste. An important market also exists in many countries for the collection and disposal of commercial wastes. Major international waste companies, including a couple of United States companies, have captured much of this market, particularly in major urban areas. European firms, particularly French and Spanish ones, are aggressively pursuing this sector, and have proved the most competitive so far.

Although industrialization is driving growth in the Latin American hazardous waste market, the region continues to lag behind in effective third-party treatment solutions. Efforts to develop regional hazardous waste disposal centres have floundered in the face of local political opposition, the high capital costs of such facilities and concerns about the effective enforcement of hazardous waste regulations. In the absence of disposal options, many companies are developing individual solutions to their hazardous waste problems. Most hazardous waste is currently stored on-site, which is not a long-term solution. Current opportunities in the hazardous waste market involve working with industrial and commercial customers to design strategies for effectively reducing the amount of hazardous waste generated, for recycling hazardous waste and for developing on-site treatment facilities. Unfortunately, unclear regulations are hindering the efforts of many companies to design their own on-site treatment solutions.

Air. In air pollution, comprehensive air pollution programmes are under way in many major Latin American cities. These programmes are strongly supported by the multilateral institutions, and focus on the establishment of monitoring networks, vehicle emission reduction programmes and the targeting of industrial point sources. Mexico's

programme is perhaps the most advanced, with its 1995-2000 Mexico City Air Quality Improvement Programme, which is being rolled out to Monterrey, Guadalajara, Toluca and Ciudad Juarez. Vehicles are often the largest contributor to urban air pollution, and are responsible for 80 per cent of air pollution in Buenos Aires, for instance. For vehicles, efforts have focused on the use of cleaner fuels, more stringent emissions requirements and vehicle testing. In industry the main targets include power, mining, petroleum, paper, chemical and automotive industries.

8.5 China: Pieces Falling into Place in the Environmental Market

The development of an environmental industry in China over the first decade of the 21st century should be an interesting case study for domestic and international policy in environment, economics and trade. The 2008 Olympics provide an international spotlight on Beijing, and the Chinese Government has undertaken to make considerable progress before that date. A number of Western environmental firms have reported increased interest and specifically the world's largest environmental consulting and engineering firm, CH2M Hill, has been retained to play an important coordinating role for the environmental aspect of the Olympics, reprising and presumably upgrading a role it played in Australia for the Sydney Olympics. The Olympics, however, should not be the primary driver for environmental quality in a nation of 1.4 billion people. But it does serve as an impetus and pertains to trade issues relating to deficits and surpluses, WTO membership, the "most-favoured-nation" status in the United States and human rights issues.

China's environmental market has been extremely difficult to assess owing to the absence of reliable and consistent qualitative and quantitative data. There are a number of conflicting figures for environmental spending, for instance, and it is not clear what these figures represent. According to the first national survey of China's environmental industry by the National Environmental Protection Agency (NEPA), China had 8,651 environmental firms employing nearly 2 million people in 1998. In 1993, these firms reportedly

generated revenues of Rmb 31.1 billion (US$ 3.7 billion) and profits of Rmb 4 billion (US$ 481 million). Revenue figures are believed to cover all aspects of environment, from garbage collection to environmental infrastructure costs. An official source indicated that the annual environmental investment amounted to Rmb 26.2 billion (US$ 2.4 billion) in 1994, roughly 0.7 per cent of GDP. The same source reported that 1995 spending was around Rmb 20 billion (US$ 2.4 billion) and that investment would exceed this figure in 1996. About Rmb 9.6 billion (US$ 1.15 billion) would come from various central government departments and the rest from local governments and enterprises. According to another report, the Chinese Government spends about Rmb 20 billion (about US$2.3 billion) annually on environmental protection, or about 0.7 per cent of its GNP. According to another report, quoting NEPA Administrator Xie Zhenhua, China invested about US$ 1.2 billion in 1991 and US$ 1.38 billion in 1992. The same report said that China expected to invest US$ 1.84 billion in 1995 and US$ 3.45 billion by 2000.

According to a United States Embassy report entitled "Hard Currency Financing for Environmental Projects in China", approximately 10 per cent of an estimated US$ 15 billion overall market for environmental goods and services in China comes from the bilateral and multilateral lending sources. These are led by the World Bank, the Asian Development Bank, Japan's Overseas Economic Cooperation Fund and bilateral assistance programmes. The same report also stated an estimated 10 per cent comes from foreign investors setting up joint ventures, and another 20 per cent comes from various industrial ministries or the Chinese military for treatment of factories and installations under their control. These sectors offer a "significant" source of contracts for foreign companies in the future, the report said. The remaining 60 per cent of total financing is controlled by city or country governments, usually in the areas of basic sanitation, recycling, potable water and trash removal, but with few opportunities for foreign companies. According to yet another report, China announced that it would spend US$ 4 billion on 62 environmental research projects covering nine major topics (such as clean energy and sustainable agriculture). This will coincide with the

country's Five-Year Plan. This report indicated that about 40 per cent of the funding will come from overseas.

EBI estimated China's total environmental market in 1995 at around US$ 3 billion, which grew to US$ 3.7 billion in 1997, US$ 4.2 billion in 1998 and US$ 5 billion in 2000. The largest segments are water equipment and chemicals at more than US$ 1 billion, followed by the infrastructure segments of water utilities, solid waste management and wastewater treatment works, each of which are in the US$ 600-700 million range. Forecast growth is strong at 10-14 per cent, with these infrastructure supply and service segments leading the way.

9. Potential for Environmental Industry Development in Developing Nations

Given the state of the environmental industry and the great variety of environmental market conditions and drivers in the nations of the world, it is hard to make definitive statements about such a broad topic. Nevertheless, some common themes and recurring situations in many countries allow the following conclusions.

It is clear that needs and demand for environmental services will continue to grow in the developing world for some time, thus providing increasingly good business conditions for environmental service firms.

- Environmental needs do not always translate into market demand for environmental services owing mostly to economics, and so continued involvement of the public sector and international development and funding agencies will be important in maintaining the consistent market demand required in order to attract private environmental companies and investment in environmental industries in developing nations.
- It will be very difficult to create quickly the domestic capacity required by developing nations in order to meet environmental

service needs in their nations, since technology, educated and trained personnel and funding are all necessary.

- Input of resources from developed nations will be crucial for building and accelerating capacity in environmental services in developing nations. Appropriate incentives for foreign businesses in the form of security for return on investment by allowing ownership, partnerships, public-private partnerships and other mechanisms to secure long-term business commitments and investments from foreign companies will result in accelerated capacity development.
- Mechanisms should be encouraged to increase the freer flow of environmental industry exports and imports across borders through trade agreements, and this will accelerate environmental technology transfer among nations.

10. Capacity Building in Environmental Services

Opportunities for developing countries to strengthen capacity in environmental services depend on a few key issues: (a) creating market demand; (b) policy to encourage foreign participation and technology transfer; (c) a clear position on privatization; and (d) education and training to create a competent labour force and selection of contractors. These are discussed in more detail below. It goes without saying that the discussion of these factors focuses on what is unique to the environmental industry, and that there are many factors which apply to all business, such as currency conversion, political stability, safety and security, transparency of the contract selection process and lack of corruption.

(a) Creating consistent market demand is the best way to create environmental industries in nations. The public must be educated, laws must be passed, regulations must be put in place and enforced by empowered regulatory authorities, Governments must be accountable for environmental quality to both their people and the international community, and, most important, industries must have a disincentive to pollute, generate waste or consume resources unsustainably.

Disincentives may be in the form of fines, plant closures or lawsuits, or they may be in the form of economic instruments such as pollution taxes or waste disposal fees. Punitive measures are perhaps easier to enforce, but economic instruments are better for creating an ongoing incentive for continuous environmental improvement. Years of analysis of environmental markets lead to the conclusion that the command-and-control method of punitive environmental policy is the most effective in transitioning a nation from environmentally "deplorable" conditions to conditions can be deemed "acceptable", but that going beyond that "mediocrity of acceptability" requires the implementation of economic instruments. This is the lesson of environmental market evolution in developed nations, many nations now being at the point of flattened demand for environmental services and equipment as basic compliance with most standards has been achieved, but nations do not have the leadership or political will to implement broadly inclusive market instruments. Applying this lesson to the developing world, nations should adopt a hybrid approach that has definitive and harshly punitive measures for those that flout environmental laws and standards, and at the same time should implement measures which charge incremental fees or taxes for each unit of waste and pollution generated. To return to the central point of creating capacity in environmental services, without the best system of market drivers for environmental improvement, companies will face insecure demand and not invest in building capacity in such a market.

(b) Beyond the critical issue of creating market demand through a combination of environmental and economic policy, developing nations can accelerate their capacity development in environmental services by making business more attractive to foreign companies with policy measures relating to ownership, movement of persons and investment credit, and many other policy instruments in customs and commerce.

(c) A critical issue in environmental industry development is the question of privatization. The largest segments of environmental services pertain to waste management, sewage treatment and potable

water supply, and each of these has strong municipal or other public sector ties in their provision. Developing nations can develop business capacity much more rapidly if there is ample incentive for investment and return on investment by private companies (rather than solely relying on donor nations or agencies or in-country funds) through limited or broad forms of privatization. Long-term contract concessions, limited guarantees on rates and payments by the users or "rate base" and other agreements can be concluded. In attracting qualified companies to work on environmental service projects, the position regarding the level of privatization may not be as important as how clear that position is for the company looking at the opportunity. What any business likes is certainty and what the company can plan for; consequently, any uncertainty about contracts and changes in privatization approaches will be sufficient reason for companies not to pursue business in a particular country or city.

(d) Education programmes to create a flow of new generations of environmental engineers and a long list of other professional personnel are important to capacity development. The training of skilled labour is equally important for constructing and maintaining the environmental service infrastructure. Programmes at the vocational level all the way up to advanced university degrees in environmental sciences should be made available to citizens of every country. In many cases, motivated scientists from the developing world have left for better education in the developed world; this may be acceptable if a significant portion of these people return to impart their knowledge in their native markets. Avoiding the "brain drain" is not unique to the environmental industry but applies to many other sectors. Environmental industry employment has a considerable advantage in that a majority of environmental service personnel are not highly qualified and educated people, but merely skilled or unskilled labour. Many multifaceted environmental projects in solid waste, wastewater or remediation clean-ups may involve a foreign company in managing the project but using many local contractors and labourers to construct and operate its designs. Thus another layer of capacity is an ample supply of local contractors certified or at least

proved competent enough to secure subcontracted projects from leading environmental firms from developed nations.

11. Advantages and Disadvantages for Developing Nations in Eliminating Trade Barriers in Environmental Services

Advantages in reducing or eliminating trade and non-trade barriers in environmental services include the following:

- More financial incentive for foreign providers to bring their products and services to developing markets;
- Open markets create more incentive for developed country environmental firms to establish partnerships and joint ventures in developing nations;
- Cheaper access to the best environmental solutions;
- Easier movement of persons allows easier transfer of expertise;
- More momentum towards a uniform global market in some environmental industry segments can lead to more uniform and cost-effective environmental solutions;
- Reducing or eliminating trade and non-trade barriers in environmental services will serve to make export markets more appealing to global environmental companies, but national Governments will have a significant role in ensuring that foreign providers make sustained investments in local communities, and with local governments and local companies to ensure ongoing capacity building in environmental services.

Disadvantages in reducing or eliminating trade and non-trade barriers in environmental services include the following:

- Possibility of over-reliance on foreign supply;
- Possibility of under-investment in capacity by in-country companies grown dependent on foreign expertise;

- Potential for cultural or ethnic clashes related to foreign business or interests being responsible for, and profiting from, essential public services such as water. This could also relate to potential negative perceptions of "environmental imperialism" on the part of foreign experts running projects and systems or "dumping" their old or not so good technology on developing markets;
- Any international business has to deal with these potential negative issues; however, provided that environmental projects are open, public and transparent, these issues can be kept to a minimum.

12. Potential for Developing Nations to Become International Providers and Exporters of Environmental Services

With very broad needs in developing nations for environmental services, prospects would appear promising for early leaders in environmental industry capacity to be able to be regional or international providers by exporting their services.

However, much of international environmental business requires more than just adequate business capacity. It requires experience and talent in many areas and access to capital. International environmental business players need an integrated package of technology, trained personnel, political experience in target markets and, perhaps most of all, direct knowledge of, and access to, project financing and funds. Many long-term environmental contracts in water or waste require that the project developers build in mechanisms for fee collection or development loans to ultimately pay for their services.

The combination of skills required of an international player in environmental services makes it very difficult for entities in developing nations to compete initially. For instance, many American firms very competent in the technical aspects of environmental projects (environmental consulting and engineering firms typically) have little ability in the full-scale project development, construction and management required in integrated environmental infrastructure

projects typical in developing environmental markets. However, potential does exist for developing nations' environmental companies to form partnerships with experienced international environmental industry competitors and then seek involvement in neighbouring countries. Likewise, some opportunities will be available for small companies to execute specific pieces of projects or to work in smaller market niches (air quality monitoring, environmental information systems, industrial water recycling) that are numerous in the environmental industry.

Overall, meeting the demand of in-country markets should be the strong first priority of environmental service industries in developing countries. Surveys of environmental companies have routinely found that the cost of doing business out-of-country is almost twice as high as pursuing domestic opportunities. If capacity is built and demand is strong elsewhere, it is an opportunity worth pursuing, but not many companies will do it.

A nation's environmental industry competitiveness ultimately hinges on what the market demand is in its home country. In other words, the best way to create a highly competitive environmental industry is not to adopt a whole series of industry development policies, but merely to establish a strong consistent demand through a coordinated environmental and economic policy structure to create an incentive for continuous environmental improvement in industry and government.

In conclusion, the objective of the nations of the developing world seeking to better environmental quality on behalf of their people and the objective of the world's leading environmental companies seeking to expand and grow their business are mutually supportive. Reduction or elimination of trade and non-trade barriers in environmental services can only serve to further both of those objectives—and result in the desirable objective of capacity development in environmental services in developing nations—provided that Governments are sufficiently educated about the nature and structure of successful partnerships in environmental service contracts and about market conditions.

ENHANCING DOMESTIC CAPACITY IN THE ENVIRONMENTAL SERVICES SECTOR: THE CASE OF BRAZIL

Fernando Rei and Oswaldo Lucon*

1. Brazil's Unique Conditions

Owing to its size, natural resources volume and industrialization level, Brazil has to continuously handle several diverse environmental problems. On the one hand, it is a country that has about 12 per cent of the world's available freshwater; this allows it to meet most of its energy needs through the utilization of hydroelectricity, a renewable source with a relatively small environmental impact. Brazil also has a relatively high proportion of the world's tropical forests.

The advantages stemming from this relatively favourable scenario of natural resource abundance are evident. On the other hand, there also is the permanent challenge for policy makers to find new development models for the country that do not threaten to jeopardize the sharing of those resources among the different communities or regions, be they rich or poor.

Besides the problem of pollution caused by automobiles, industries, domestic/industrial waste, toxic agricultural products and garbage disposal, there is the problem of the degradation of natural

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wealth. While in the large cities the living conditions are unpleasant from an environmental point of view for most of the population, in the countryside the deterioration and even destruction of both flora and fauna are a threat to biological diversity.

In the last few years, the sustainability concept has gradually been incorporated into the realms of public administration, corporate strategies and Brazilian society's organizations. At the federal level, the first stage in achieving this was the establishment of a National Environmental Secretariat in 1972. This was the true embryo of today's National Environmental System, embodying the Brazilian Federation's, as well as the individual States' environmental agencies.

On 26 February 1997, the Brazilian Federal Government created a Commission for Sustaineble Development Policies and Agenda 21, which was tasked with honouring Brazil's commitments under Agenda 21 and composed of government officials, representatives of private industry and members of civil society. Its goal was the elaboration of environmental action plans aimed at safeguarding the Brazilian ecosystems, and at the same time guaranteeing economic growth and the preservation of natural resources.

Four years later, the São Paulo Secretary for the Environment, Dr. José Goldemberg, established a new approach for environmental protection, based on renewable energy as a driving force for sustainable development and its main implications, such as poverty eradication and the access of small isolated communities to basic infrastructure. The outcome of this policy is the so-called Brazilian Energy Initiative, a commitment to a minimum share of 10 per cent in renewable energy, endorsed on 15 May 2002 by 21 Ministers for the Environment from Latin American and Caribbean countries. This result will be presented in June to the Bali Preparatory Conference for the World Summit on Sustainable Development, to be held in Johannesburg in September 2002.

Brazil was the first Latin American country to introduce and implement a coherent package of environmental laws, and later some of the Federation's States developed their own legislation. Each local agency is individually tasked with local environmental management, as well as with legislation enforcement and auditing each and every local activity or undertaking with a potentially adverse effect on the environment. The most advanced of these agencies is probably that of the State of São Paulo, the Environmental Sanitation Technology Company (Companhia de Tecnologia de Saneamento Ambiental (CETESB)). It is a government-owned institution which has been developing capabilities to absorb, adapt and modify environmentally sound technologies imported from the developed countries. From a humble beginning in 1968, as a quite small State Sanitation Centre, CETESB has gradually evolved into today's complex institution with wide-ranging responsibilities.

By using its own creativity and experience, CETESB has been successful in moving from a model imported from the developed countries to a pioneering performance, managing to find its own way to solve the increasingly challenging environmental issues through indigenous means.

2. CETESB's tasks

Since 1992, and in accordance with Agenda 21, CETESB has been tasked with the promotion of sustainable development in the State of São Paulo through the implementation of a new approach based on a combination of *command and control and pollution prevention.* As a result, it has adopted and stressed the following objectives:

- To stimulate the incorporation of the environmental factor into economic development matrixes, primarily considering the importance of attaining reductions in both waste generation and resource utilization;

- To increase public awareness about environmental issues by the disclosure and dissemination of information concerning environmental quality and emissions status;
- To create new channels to involve society in the implementation of environmental policies and guidelines;
- To establish partnerships with the private and public segments and foster cooperation with national and international organizations;
- To provide training and technology transfer;
- To improve legislation in order to consider the preventive approach;
- To support voluntary environmentally preventive initiatives;
- To motivate the financial institutions to increase investments in cleaner production technologies and pollution prevention projects, also helping develop innovative financial mechanisms; and
- To include the preventive approach to CETESB's actions, providing the company with the means to fulfil its new duties.

The agency's main tasks are the following:

- Environmental quality control: to evaluate air, water and soil quality; to develop and evaluate technical proposals and environmental standards;
- Control of pollution sources: to license and monitor pollution sources;
- Development of environmental technologies: to adapt, develop and utilize appropriate environmental technologies:
- Technology transfer: to disseminate information about and train personnel in environmental protection practices;
- Pollution Prevention (P2): After the 1992 Rio Conference, CETESB set the goal of implementing Agenda 21 and promoting

sustainable development. In the last few years it has implemented a new approach aimed at pollution abatement at the source, by jointly working with the industrial sectors to introduce cleaner manufacturing technologies, through using less aggressive compounds and implementing process changes able to cut pollutant emissions;

- Energy efficiency (E2) and global issues: together with P2, measures relating to climate change mitigation, cleaner energies, energy conservation and ozone layer protection have been implemented since 1994 by a dedicated staff, interacting closely with Federal Government policies and, on many occasions, establishing benchmarks such as greener procurement.

Energy is a key issue in sustainable development in terms of social welfare and production, as well as pollution, climate change and resource depletion. CETESB's approach to energy and the environment has the following main objectives:

- To propose and conduct internal and external energy efficiency (E2) programmes (the internal E2 programme saved 36 per cent of electricity);
- To provide training and awareness;
- To foster the use of new renewable and other cleaner energy sources;
- To support municipalities and other public bodies in terms of E2;
- To suggest improvements in standards and legislation;
- To advise on specific issues, for example financial assistance, nuclear energy, natural gas thermoplants or site recovery and preservation;
- To promote partnerships with concessionaires, small and medium-sized enterprises and other private sector players.

Under Agenda 21, the Government of São Paulo has – together with the applied precautionary approach in enforcement – conducted

several public audiences with sectoral committees, non-governmental organizations, universities and other governmental bodies.

Water resources protection is another main issue, in terms of emissions control, water usage or land use. The polluter-pays principle is currently at the State parliamentary voting stage.

The outcomes of these projects are certainly interesting to countries now experiencing the same problems. In the case of neighbouring countries, CETESB considers the techniques and services supplied could be considered by possible customers to be more attractive, adequate and appealing than those that could be supplied by the developed countries, because of the affinities and similarities among the region's environmental problems and also because of the lower language barrier and Brazil's greater understanding of the way in which businesses are conducted regionally. CETESB has been providing advisory services to other Latin American countries (notably Argentina, Chile, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela). Also, it has been training several technical representatives from Latin American and Portuguese-speaking African countries, and plans to sell their services to many other countries as well. The revenues derived from those activities will help fund further environmental initiatives in the State of São Paulo.

After more than 30 years of innovations, CETESB has achieved two major results: it has become MERCOSUR's reference agency and has become widely recognized as an environmental excellence centre.